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THE LONDON NATURALIST

The journal of the
LONDON NATURAL HISTORY SOCIETY

No 65

Published 1986
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LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32 km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology or rambling, there is a section ready to help.

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The *London Bird Report,* also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

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THE LONDON NATURALIST

The journal of the
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No. 65

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Some examples of immigrant Lepidoptera recorded in the London area

Swallowtail
Papilio machaon Linnaeus,
ssp. *bigeneratus* Verity
Rosas, Spain, 1984. P. S. Hyman
C. W. Plant coll.

Camberwell beauty
Nymphalis antiopa (Linnaeus)
Spain, 1978. W. and M. Manley
C. W. Plant coll.

Vestal
Rhodometra sacraria (Linnaeus)
East Ham, Essex, 26.ix.1983
C. W. Plant coll.

Humming-bird hawk-moth
Macroglossum stellatarum (Linnaeus)
No data
A. W. Mera coll.

Flame brocade
Trigonophora flammea (Esper)
No data
A. W. Mera coll.

Silver barred
Deltote bankiana (Fabricius)
Killarney, Co. Kerry
A. W. Mera coll.

Scarce silver Y
Syngraphe interrogationis
(Linnaeus). Kincardineshire,
1900. A. W. Mera coll.

White-point
Mythimna albipuncta (D.&S.)
Sandown, Isle of Wight,
18.viii.1897. L. B. Prout.
A. W. Mera coll.

Long-tailed blue
Lampides boeticus (Linnae
Johannesburg, South Afri
1965. J. V. Dacie
C. W. Plant coll.

The delicate
Mythimna vitellina (Hübner)
Torquay, Devon, ix.1905
A. W. Mera coll.

Great brocade
Eurois occulta (Linnaeus)
Rannoch, Tayside
A. W. Mera coll.

Bordered straw
Heliothis peltigera (D.&S
Devon, 1906
A. W. Mera coll.

Death's-head hawk-moth
Acherontia atropos (Linnaeus)
Plaistow, Essex, ix.1979
C. W. Plant coll.

Rannoch looper
Semiothisa brunneata Thunb.
Rannoch, Tayside
A. W. Mera coll.

Spotted sulphur
Emmelia trabealis (Scopo
Essex. A. W. Mera coll

Colour transparency by G. R. Gray

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Recording forms are available from John Bennett (s.a.e. please). Records may be sent to the appropriate recorder or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Requests for information should be made to the appropriate recorder or to John Bennett.

Contents

Immigrant Lepidoptera in the London area .... *Frontispiece*

Officers for 1986 3

The Society's Recorders 4

Report of the Society for 1985 6

Migratory Lepidoptera in the London area — COLIN W. PLANT 7

Gravel workings — a landscape feature in Epping Forest — R. L. LAYTON 31

A quantitative approach to oak variability in some north London woodlands — M. J. INGROUILLE AND S. M. LAIRD 35

The flora of Totteridge and its neighbourhood — DIANA GRIFFITH 47

Hay meadow flora at Fryent Country Park, Middlesex — L. R. WILLIAMS 65

Banstead Woods – an ecological survey — MICK DOUGLAS and ANGELA M. BRUNT 83

The Chinese mitten crab *Eriocheir sinensis* Milne Edwards – a contentious immigrant — R. W. INGLE 101

Mites of the grey squirrel *Sciurus carolinensis* Gmelin in Epping Forest — K. R. SNOW.. 106

A working list of the hoverflies (Diptera: Syrphidae) of the London area — C. W. PLANT 109

Hemiptera-Heteroptera of the London area. Part XVI — ERIC W. GROVES 119

The bush-crickets of Thamesmead — PATRICK ENGLISH 179

Survey of Bookham Common: Forty-fourth year Progress report for 1985 181

Botanical records for 1985 — R. M. BURTON.................................. 193

Obituaries:

GEOFFREY EDWARD MANSER, 1917-1986 199

RONALD ARCHIE BONIFACE, 1913-1985 200

ROBERT SPENCE WATSON POLLARD, 1907-1985 200

Statement of affairs at 30 June 1985 201

Book reviews..............................30, 33, 34, 64, 82, 100, 105, 118, 178

Report of the Society for 1985*

The Society has continued to extend its activities during the past year. We have purchased an Apricot XI computer, the main purpose of which will be to store the Society's records, including a site analysis. This will be for the use of members and also if conservation organisations ask for site lists, these will be readily available. The Passmore Edwards Museum Trust Ltd has kindly allowed the Society to use its recording program for the sum of £1 and this is currently being run at the Museum. Initially only new records will be loaded, but it is intended that the full backlog will be put on in due course. As well as records, the computer has scope for many other uses, including word processing, the library catalogue, membership lists, accounts and so on. It will eventually be housed at Imperial College, though it is portable.

Elsewhere on the recording side work on the *Butterfly Atlas* continues and recording continues to develop; apart from botany and ornithology, facilities now cover six orders of invertebrates and three groups of vertebrates. There has been further work on the Bookham Common Survey. The main ornithological research project undertaken during the year has been the Woodland Bird Survey: over 150 woods have been surveyed and the data (which includes some botanical records) are now held on computer. There has been further research into London cormorant numbers and the analysis of the winter sites records also continues. Papers were published in the 1984 *London Bird Report* on the status of the Canada goose and on the breeding status of the tufted duck in the London area. There has been continued liaison between the Society's Ornithological Research Committee and the neighbouring B.T.O. recorders.

The Society has continued to keep in close contact with the conservation trusts which work in its area. Links have also been re-established with Dungeness Bird Observatory by the appointment of an active member of the Society to the observatory committee. As part of a change in financial policy, the Society has instituted a system of grants which can be paid to further the Society's aims. Five bat detectors have been purchased for the use of members.

The sections have continued to arrange a full and varied programme of meetings. These have included evening meetings for moths, small mammals and nightjars. Some meetings have been held during the week, as more members now seem to be free at that time, and these have proved popular. Attendances have in general been well maintained, though the poor weather in the summer put people off in some cases. The Ramblers Section's activities have been widened to cover archaeological interests, owing to retirements from the Geology and Archaeology Committee. After an interval, further geological lectures and field meetings have now been planned.

The *Newsletter* now contains fuller details and reports of sectional activities. The Press and Public Relations Officer has continued to seek ways of publicising the Society's activities via magazines, the press, radio and television. There have been further mail shots and all 'central libraries' in the L.N.H.S. area have now been circulated with information about the Society.

The good increase in members over the past few years has also been maintained. In the year to 30 September 1985 we enrolled 265 new members compared with 230 in the year to 31 October 1984. Deaths and other losses due to resignations and removals for non-payment of subscriptions resulted in a net increase of 119, a further improvement over last year's figure of 97.

The membership figures are as follows:

	30 Sept 1985	*31 Oct 1984*
Ordinary	1,069	*992*
Affiliated	22	*21*
Family	150	*126*
Junior	40	*29*
Senior	82	*77*
Honorary	17	*16*
Life	8	*8*
	1,388	*1,269*

Miss E. M. Hillman was appointed an Honorary Vice-President during the year.

Our thanks go to all officers and sectional committee members who do so much work for the Society. Thanks too to Mr Whitworth and his staff for custody of the Society's library and to Imperial College for the use of their rooms.

*Presented at the Annual General Meeting, 9 December 1985.

Migratory Lepidoptera in the London Area

by Colin W. Plant

(Presidential Address delivered at the Annual General Meeting on 9 December 1985)

Introduction

The phenomenon of migration is widely appreciated amongst a variety of animal groups. The seasonal movements of birds are particularly well known and studied, as indeed are the long-distance migrations of fishes such as the salmon and the eel. Far less widely appreciated however are the movements of a multitude of invertebrates, particularly amongst the insects. The migrant hawker dragonfly *Aeshna grandis* is no doubt a familiar sight to many naturalists, particularly in the south, yet comparatively few appreciate the distance which this species frequently travels. Equally familiar to London naturalists is the large hoverfly *Volucella zonaria,* but most non-dipterists to whom I have addressed the question have denied knowledge of its immigrant status in this country. Amongst the migratory butterflies the monarch *Danaus plexippus* instantly springs to mind, no doubt a familiarity encouraged by the modern medium of television, whilst in our own country few could have failed to notice the huge influx of clouded yellows *Colias croceus* from the European continent during 1983. Yet surprisingly few realise that the existence of the painted lady *Cynthia cardui* depends entirely on immigration from abroad, for, although the larvae are found in most years and frequently successfully metamorphose in the ensuing weeks to gain the imaginal state, the adults are quite unable to survive the winter which follows. Similar comments also apply to the red admiral *Vanessa atalanta,* although there is evidence in some areas of overwintering adults, but not, as far as I am aware, in the London area.

In order properly to enumerate the species of butterflies and moths which we are going to class as migratory however, we have a need to define what we mean by a migrant. Strictly speaking any movement outside the normal range of a species is a migration, and if we were to stick with this definition we would have to include, for instance, the frequent sightings of male brimstone butterflies *Gonepteryx rhamni* in central London. In this respect the title of this address is somewhat misleading, since I intend to discuss principally those species which reach us from abroad; in other words immigrants rather than migrants. Thus, I exclude from the discussion the range expansions of moths such as the dotted rustic *Rhyacia simulans* and butterflies such as the speckled wood *Pararge aegeria.* However, we still need to define immigration: is it sufficient to include all species which reach us from abroad, or should we be able to demonstrate a return movement as exhibited by many birds? After all, ornithologists make this distinction, defining birds which exhibit a unidirectional movement as ‘irruptive’ rather than migratory.

In practice however, it is not that simple to define immigrant Lepidoptera. Some species possibily do exhibit a return pattern of flight, if not by the original visitors then at least by their offspring. It has been suggested (Baker 1969) that the small white *Pieris rapae* moves north in the spring and early summer, and then back again in the autumn, but this view is not shared by other workers (e.g. Johnson 1969). There is certainly some directional movement in this species, but its regularity needs confirmation (Heath, Pollard and Thomas 1984). The real truth of the matter is that although records of immigrant Lepidoptera have been kept for many years there has been comparatively little research carried out into the nature of the movements.

I hope you will forgive me therefore, for including now all those species for which there is strong evidence that their occurrence in the London area is a result of immigration from abroad, regardless of the logistics of such movements.

There are still problems however, since a number of the species for which there are records of immigrant origin are also resident, either within our circle of twenty miles from St Paul's Cathedral or elsewhere in Britain. There is also the problem of sorting out the true immigrants from those which have arrived here other than under their own steam. Accordingly, I have found it convenient to allocate the species which I am about to discuss to a number of categories.

In an address of this nature the constraints of available time and the level of interest of what is an audience of general natural history interest prohibit me from presenting a record-by-record account of all the species. This I have made available as a list which will be published as an appendix to this address in *The London Naturalist.* A limited number of copies are available for those who are sufficiently interested at the end of this evening's proceedings.

Sources of Records

The starting point in the search for old published records has been the series of papers on London's Lepidoptera in *The London Naturalist* by Baron de Worms, commencing with the butterflies in 1950, closely followed by the moths over the next few years. Dr de Worms' biennial reviews in the same journal, which followed the completion of his review papers, have also been a primary source of data. Where possible these data have then been traced back to the original reference which is quoted in the appendix here as the original source. This has not proved possible in many cases however, but where this is so I have indicated the name of the original observer if known. Further sources of data have been standard works such as Cockerell's *Lepidoptera of Middlesex* published in 1891, Foster's *Lepidoptera of Hertfordshire* published in 1937, Chalmers-Hunt's work on the Lepidoptera of Kent published over a number of years as a supplement to the journal *The Entomologist's Record,* and the *Guide to the Butterflies and Larger Moths of Essex* published in 1975 by the Essex Naturalists' Trust under the authorship of Firmin and Pyman. Several records are given in works such as Skinner (1984) and in volumes 9 and 10 of *The Moths and Butterflies of Great Britain and Ireland,* by Heath and Emmet (1979 and 1983), and these have proved useful in cross-referencing records and in eliminating errors. The publication of Emmet, Pyman and Corke (1985) on *The Larger Moths and Butterflies of Essex* has provided a further source. The annual migration records published in *The Entomologist* by Danreuther from 1934 to 1952 and French from 1953 until 1958, and then by Bretherton and Chalmers-Hunt elsewhere from 1979 to date, have also been extensively searched. To these literature sources must be added a great many records directly communicated to me as recorder for the area, by members of this Society and by others, and in particular by Russell Bretherton.

Group 1. Species which are long established as common residents in the London area, which also occur or have occurred as true immigrants from abroad

There are six species in this group: one 'micro', *Plutella xylostella* known as the diamond backed moth, a fairly widespread species whose larvae feed on a variety of crucifers to give adults in May then August/September; one tortricoid, *Cacaecimorpha pronubana,* first recorded as British in 1905 and noted in the Chiswick area of London from as early as 1907; two butterflies *Pieris brassicae* the large white and *P. rapae* the small white; then two extremely common and widespread noctuids, *Xestia c-nigrum* the setaceous hebrew character, and *Phlogophora meticulosa* the angle-shades, also known in London as the cherry-eater.

Numbers of *P. xylostella* vary considerably from year to year, and low numbers in certain years, when migrant activity generally is poor, probably reflect the true resident population. With the remaining species however, they are usually present in such abundance that it is difficult to assess whether an immigration is taking place unless abnormally large numbers present themselves in the trap on the same night that species which are solely immigrant are also captured. For example, an influx of *P. meticulosa* noted at Addiscombe, Surrey on 22 October 1977, coinciding with large numbers of *A. gamma* and a single scarce bordered-straw *Heliothis armigera* doubtless point to an immigration. On most other occasions however, such supportive evidence is lacking, and consequently the true effects of immigration on the populations of these species are poorly documented.

Group 2. Species which are resident in Britain, some quite commonly, at some distance away from the London area.

These have all occurred at least once in the London area as true immigrants, but because of their residency elsewhere there is sometimes difficulty in deciding whether or not their occurrence reflects immigration or internal movement.

Here I include fifteen species, comprising one butterfly, two geometers, one arctiid and eleven noctuids.

Nymphalidae. The large tortoiseshell *N. polychloros* was last recorded in any abundance in Britain in 1948, and it is possible that it is only temporarily resident in any case. In London it became scarce much earlier, around 1920, and did not make a comeback until 1948, a year noted for the immigration of this species to Britain. There are thirty-two records for the present century in the London area, although it is felt by Bretherton (pers. comm.) that some or most of these may relate to stray individuals from elsewhere in Britain.

Geometridae. The rest-harrow *Aplasta ononaria* is confined as a resident to Kent, particularly at Folkestone Warren and between Sandwich and Deal. The single London record, from Westerham, Kent in 1947 is thought to relate to an immigrant since singletons were also noted at Dover, Kent and Tilgate, Sussex a few days later. The other geometer here, the rannoch looper *Semiothisa brunneata,* a resident of central Scotland, can be definately regarded as an immigrant to our area. An influx during 1960 of eight examples, two of which were recorded in the London region, were all much larger than the Scottish form and are thought to have originated in the Ardennes.

Arctiidae. The single arctiid is the four-spotted footman *Lithosia quadra,* a resident in Hampshire, Dorset, Devon, Cornwall and the Scillies, and there are eighteen records for London, all probably of true immigrants.

Noctuidae. Only two of the ten noctuids in this group have occurred in excess of ten times in our area. The great brocade *Eurois occulta* is widespread and locally common in the Scottish highlands but is also a regular visitor from northern Europe to the eastern side of Britain, more frequently in the north than in the south. Twenty-one specimens are noted for the London area, eighteen in the present century, eleven of these since 1950. Just ahead of this species however, with twenty-two London records is the Clifden nonpareil *Catocala fraxini.* The claim of this large insect to residency lies in a colony of Orlestone Woods, East Kent from 1935 to 1964. However, it is fairly certain that all the London records, as with *E. occulta* are of immigrant insects, although there is the slim possibility that occasional records of *C. fraxini* may relate to strays from a temporarily resident population outside the London area.

Working down the list in order of decreasing frequency we come first to the angle-striped sallow *Enargia paleacea* with five records, three prior to 1900 and the other two both from 1964, a year in which between forty and fifty immigrant examples were noted in the country as a whole. Although the moth's range extends throughout the holarctic region, in Britain it is resident only from

Worcestershire northwards. In fourth place is the scarce silver-Y *Syngrapha interrogationis,* resident here north of a line from the Wash to the Severn apart from a few isolated colonies in Devon. Most immigrants are referable to the Finnish ab. *norrlandica* Schulte, although some presumed immigrants from the south more closely resemble a form found in central Germany and the Alps. It is not clear to which type the four London records are referable. The white-point wainscot *Mythimna albipuncta* is included here as a resident since it frequently breeds from early arrivals and possibly establishes itself intermittently for successive years on warm shingle beaches and cliffs. There are three London records, in 1951, 1960 and 1969. The golden rod brindle *Lithomoia solidaginis* has occurred three times in the London area: A resident from Shropshire, Warwickshire and central Wales northwards it was noted three times on 28 August 1954. The flame wainscot *Senta flammea* was first discovered as new to science from our area in 1828, when one was taken near Lewisham in July. The only other London record is of one at Pinden in 1964, on the same night that another example was taken elsewhere in Kent outside our own area. It is of interest to note that these three referred to here are also the only Kent records. The pretty marbled *Lithacodia deceptoria,* a possible resident of some ancient woodlands in Kent from 1948 to 1956, was noted twice near Reigate in 1952, (actually just outside the London area but included here to avoid confusion since 'Reigate' was quoted as the locality in the entomological literature, being the nearest big town). This leaves us with three species that have occurred once only in the London area. The silver barred *Deltote bankiana* is a local resident of the Fens, and the record from North Harrow, Middlesex, in June 1971 probably relates to a primary immigrant rather than to a wanderer from there. The gold spangle *Autographa bractea,* frequently encountered as a resident in Wales, western and northern England and Scotland, was noted at Totteridge in 1956; and the lunar double-stripe *Minucia lunaris,* temporarily resident in East Kent from 1942 to 1958, (and possibly also in East Sussex from 1873 to 1880), was noted at West Wickham Woods in 1860.

Group 3. Species whose occurrence in the London area is solely as a result of immigration from abroad. Some early arrivals may breed, but their progeny are unable to survive the ensuing winter.

Here I include four pyralids, nine, possibly ten, butterflies, three geometers, eight hawk-moths, one arctiid and eighteen noctuids, making in total forty-three species, possibly forty-four.

Pyralidae. *Udea ferrugalis* is recorded sparingly in most years, and is almost certainly totally dependent upon immigration for its presence on the London area list. In favourable seasons it does breed in Britain, but there are no confirmed records of over-wintering, nor are there any records of larvae in the London area. The rush veneer *Nomophila noctuella* is a moth of almost annual occurrence, and is probably frequently encountered but seldom identified by most of us here tonight. It alledgedly establishes itself on *Polygonum aviculare* or *Trifolium* spp. but is unable to overwinter. There are no records of larvae available for the London area to date. *Palpita unionalis* is normally a rare visitor to Britain however, with occasional years of relative abundance. There are twenty records for London, seven between 20 and 24 July 1955, one in 1958, two in 1959, one in 1961 and nine since the end of 1979. A lack of interest exhibited by many possessors of light traps in anything not classed as a 'macro' however may have resulted in an under-recording of this species. Most specimens probably originate from south-western Europe. Finally, *Diasemiopsis ramburialis* is a rare immigrant to Britain from the same region of the continent. There are two records, for 1961 and 1967 in London.

Papilionidae. Much confusion arises over escapes and deliberate introductions of the British race of the swallowtail butterfly *Papilio machaon* ssp. *britannicus,* but here I include only the continental subspecies *bigeneratus.* This is larger and brighter than the British subspecies, and has been reliably recorded six times, the most recent being at Bexleyheath in 1962.

Pieridae. The clouded yellow butterfly *Colias croceus* is a warmth loving insect and in the Mediterranean area it is often continuously brooded throughout the year. From here it spreads northwards to the rest of Europe in the summer months and in several years reaches Britain. In exceptional years only, large numbers are reported in Britain, and London receives its quota as elsewhere. Its abundance in Britain seems to depend on the numbers that migrate and breed in May and June, producing a new generation in August and September. These may in turn migrate further north and there is good evidence for a subsequent return southerly movement (Williams 1958). In the London area, particularly good years have been 1947, 1967 and 1983 during the present century. The female clouded yellow has a strikingly pale form known as *helice*. About ten percent of a population are usually of this type and there is, as a result, frequently a deal of confusion between this and the pale clouded yellow *C. hyale*. This latter species is itself so similar to another species, Berger's clouded yellow *C. australis*, that it is necessary to lump both *hyale* and *australis* together for the purpose of this discussion, and to exercise considerable caution in accepting records of this complex as distinct from *croceus helice*. It is certainly unclear whether both *hyale* and *australis* have been recorded in London, or whether only one has been seen, (in which case, which one?). In any event 'it' is far less common than the clouded yellow, and apart from 53 in the Eynsford/Shoreham area of Kent in 1947, I have available only about a dozen records of singletons. The other pierid in this group is the bath white *Pontia daplidice*. Prior to 1945, only about sixty examples had been reported in the whole of Britain, but in that year at least 650 were reported between July and October. Thirteen of these were from the London area. The only other records are of one at Addington in 1894 and one at Feltham in 1946 on the very early date of 21 April. There is just a slim possibility that this may have been an hibernated individual.

Nymphalidae. Both the red admiral and the painted lady were mentioned in the introduction; both are just about annual in their occurrence, although there have been a number of poor years of which 1984 was one. The Camberwell beauty *Nymphalis antiopa* is perhaps equally well known to most but a good deal scarcer, and the familiarity of many naturalists with this species is through text books. It is infrequent, but sometimes numerous in the London area, originating from Scandinavia and probably Germany. At least fifty-seven have been reported in this area since 1900, twenty-one of these during the marvellous summer of 1976. One in a car park by the River Mole at Leatherhead, Surrey on 22 May 1977 may have overwintered, but could easily have been an early immigrant. The yellow-legged or scarce tortoiseshell *N. xanthomelas* is a butterfly of which many people have not heard. It is an eastern European species, and R. F. Bretherton (pers. comm.) considers that the single London area record from Borough Green in 1953, also the only British record, relates to a genuine immigrant. I am happy to concur. This leaves us with that rather pretty insect, the Queen of Spain fritillary *Argynnis lathonia*. De Worms (1950) states that this species was reported annually in Britain, with as many as six individuals in 1945 when there is some evidence that it may possibly have bred in this country, (although there is no evidence for subsequent over-wintering). In our area there are five definite records, for 1868, 1934, 1943, 1975 and 1982, with a possible sixth in 1976.

Geometridae. Two of the three geometers I include under this group heading are of almost annual occurrence in Britain, and in some years are numerous. Both the vestal *Rhodometra sacraria* and the gem *Orthonama obstipata* herald from south-west Europe, with the former species generally more abundant than the latter. In excess of 120 records of *sacraria* are available for the London area, the bulk of these being in that magnificent immigrant year, 1983. The number of *obstipata* recorded is at least fifty-four, and although this is certainly well below the true figure it is equally certain that the species is much less common than *sacraria*. There is some evidence that the gem has successfully overwintered in our part of Kent from 1981 to 1982, although for the time being I prefer to list it in this section with the non-resident immigrant species. Blair's mocha *Cyclophora puppillaria* was first recorded as British in 1946, and since then only about a hundred specimens have been taken, mainly in the south. The best years were 1957 and 1969, with fourteen and twenty-five specimens respectively. In the London area, records have numbered thirteen, from the first in 1955 to the last in 1983.

Sphingidae. Of the eight hawk moths in this group, four are of fairly regular, though not necessarily annual occurrence in the London area, frequently in some number. Perhaps the most widely known of these is the largest of British moths, the death's-head hawk *Acherontia atropos*. There is evidence to show that at least fifty examples have been noted here, although this is an under-estimate, since records of 'a few' or 'several' can obviously not be enumerated. Early spring visitors frequently breed, and larvae have been reported on a number of occasions from a wide area in such favourable years. In other years, like several other species, *atropos* seems to pass us by, even though reported widely elsewhere in Britain. The species occurs abroad throughout Europe, Asia and Africa, as indeed does the equally large convolvulus hawk *Agrius convolvuli* which is also known from the Pacific region. This is another fairly regular visitor to our area with good numbers in favourable years. A total of at least sixty-five individuals are recorded. The humming-bird hawk *Macroglossum stellatarum* is another sphingid of regular appearance in our area. It is, of course, a day flying moth, and in summer months when there is immigrant activity can often be located in early evening at flowers of *Lonicera* and other nectar sources. The figure of forty-five individuals is certainly below the true figure; For example, de Worms (1954) states 'Petts Wood [Kent] numerous in 1944'. The striped hawk *Hyles lineata livornica* on the other hand can be more reliably enumerated. Occurring in just about all the regions of the world apart from the tropics and the poles, it is of almost annual occurrence in Britain, particularly good years including 1943, with 543 reported, and 1949, with 321 noted. In recent years however it has become more scarce, although an early influx during 1985 produced good numbers in the south, one of which made its way to Beckenham on 18 April. These insects reached Britain in two waves, from 2-10 April and then from 16-21 April, and originated from the Canaries or that part of Africa adjacent to here (Davey 1985). In all I have noted thirty-one London area records, eleven in the last century, and twelve of the remainder prior to 1950. Next in order of numerical frequency comes the bedstraw hawk *Hyles gallii* with twenty-eight records, seven prior to 1900, three together in 1929 and the remainder largely in the 1970s. It is an infrequent visitor to Britain from western Europe, and the years in which in excess of fifty have been recorded in the whole of Britain are 1870, (the best ever with 71), 1888, 1955 and 1973. An excellent account of the 1973 immigration was given by my predecessor as Recorder, Baron de Worms, in *Ent. Rec.* **87:** 232-239 (1975). The oleander hawk *Daphnis nerii* on the other hand is a rare visitor to Britain, absent in many years. The greatest number ever recorded was thirteen in 1953, two of which were in our area. It is pleasing therefore to report as many as fifteen records in total for the London area. There are however, no British records since the last in 1975, and none in London since 1953. Also on fifteen records is the silver-striped hawk *Hippotion celerio*. A fairly cosmopolitan insect, it is a rare visitor to Britain, and years in which records have exceeded ten number only four, (1865, 1868, 1885 and 1963). None has been noted in Britain since 1978 to my knowledge, and none in our own area since 1958. Bringing up the rear, so to speak, in the Sphingidae here is the spurge hawk *Hyles euphorbiae*, with a humble four records, one each in 1973, 1976, 1977 and 1979. Possibly this species ought to be grouped with the former residents on the strength of two pupae dug at Kew Gardens in March 1907, which later produced adult moths, although it is uncertain whether these were introduced as larvae or truly represented over-wintering by the progeny of a 1906 immigrant. Larvae were also noted in 1939 at Woldingham, Surrey, and the date, September, clearly indicates an earlier immigration. The species ranges on the continent from the Canaries to Iran and Asia, and it is from this region that our visitors travel. One example however, at Warley, Essex on 28 July 1979, was smaller and browner than normal and may possibly have been of the Atlantic Islands race, particularly as other long distance migrants were recorded in Britain on the same night.

Arctiidae. The crimson speckled footman *Utetheisa pulchella* is the only representative of this family which is purely a visitor to Britain. Such immigrants are thought to herald from the Mediterranean region although the species occurs through much of the Palearctic. The adults fly in sunshine, and immigrations occur from May to October, mostly in the latter part of this period. Fifteen have been recorded in the London area, ten since 1900.

Noctuidae. Certainly the most numerous noctuid immigrant in our area is the silver Y *Autographa gamma,* and it is beyond doubt also the most regular. It has been recorded in all years since 1945 and no doubt many previously. Similarly, scarcely a year passes without one or two pearly underwings *Peridroma saucia* being recorded, and the total for the area for the present century is in the hundreds but not properly documented, since there is a tendency on the part of entomologists to report only unusual species, in much the same way that ornithologists do not always include the house sparrow on their annual returns to the Bird Recorder! They are however, far less numerous than the silver-Y in spite of their matched regularity. Identical comments also apply to the dark-sword grass *Agrotis ipsilon.* Of the remaining fifteen species, only the bordered straw *Heliothis peltigera* is in any way of regular occurrence to the capital. Good years for Britain as a whole have been 1945, 1958 and 1968, with over a hundred examples in each. After a period of scarcity in the 1970s it was again numerous in 1980 and 1982. An influx in March 1957 was associated with the ni moth *Trichoplusia ni* and the striped hawk *Hyles lineata livornica,* although the April 1985 influx of the latter species apparently did not bring any bordered straws with it. It is of interest to note that the immigration of 1968 was associated with the 'dust storm' which deposited a layer of Saharan sand over much of England. The moth flies in sunshine as well as coming to light, and there are thirty-three records for London, only two relating to the previous century, (in 1891). The delicate wainscot *Mythimna vitellina* is a regular visitor to Britain from southern Europe and north Africa, which breeds in favourable years in the south although the progeny do not survive the winter. There are twelve records for the London area from 1953 to 1984, with a single earlier example from Finchley in 1866. The remaining noctuids have all occurred less than ten times in our area and I shall deal with them in taxonomic sequence.

Eversmann's rustic *Ochropleura fennica* is a species of northern Europe, western Siberia and North America. It is known in Britain from only six examples, of which one, the second British record, relates to the London area at Shepperton in 1972. All six British specimens emanated from the European population. Although the larva of the white-speck or American wainscot *Mythimna unipuncta* has been found once in the wild, its claim to residency is dubious and I prefer to disregard it. It has been reported in this country almost every year since 1956, although in our area there are only ten records, from 1962 to 1985. An earlier published record from Sutton, Surrey by de Worms in *The London Naturalist* is thought to be based on a misidentification and is deleted. A singleton at Selsdon, Surrey on 14 October 1978 was associated with sixty-one *P. meticulosa* and twenty *A. gamma.* The cosmopolitan *Mythimna loreyi* is a scarce visitor to southern England, usually arriving between late August and early October, from either western Europe or northern Africa. There is a single record from Leigh, Surrey, just outside the London area, in 1983, and I mention this here since it was reported in the literature at the time as having occurred at Reigate, the nearest large town which is, in fact, just within our boundary. The status of the nonconformist *Lithophane lamda* in Britain is uncertain and records may or may not relate to migrants. I personally favour the view that the eleven British captures, or at least most of them, are immigrant moths and I accordingly include them in this group. Four of these eleven relate to our area, all before 1900, and include the first authentic British capture of 'one on a poplar trunk in north London in October 1865' given in South (1961). The scarce brindle *Apamea lateritia* is resident in almost every European country, yet is known in Britain only as an immigrant, and then from only three examples. Two of these three are from our area: West Norwood, Surrey and Bexley, Kent, both in 1972. Dumeril's rustic *Luperina dumerilii* is another example of a moth resident on the continent yet only known here as an immigrant. There are only thirty British records, although the similarity of this moth to the flounced rustic *L. testacea* may have resulted in under-recording. There is a single London record, from Arkley, Herts., in 1953. The small mottled willow *Spodoptera exigua* is a regular visitor to our shores, noted in most years, usually in poor quantity but occasionally, as in 1962, in abundance. It has a world-wide distribution, and in some warmer countries is in fact a pest species. There are at least sixty records for our area, but, as with several other species, this is doubtless a lot lower than the true figure. The single British example of Lorimer's rustic *Caradrina flavirena* taken at Totteridge, Herts. in 1967, and now preserved in the National Collection at the B.M. (N.H.) is of the type from south-west France known as ab. *noctivaga* Bellier, now recognised by continental workers as a distinct species. It was taken on a night when other migrants of south-westerly origin were reported. Prior to 1945, there were only three authentic British records of the small marbled *Eublemma parva,* but between then and 1979 about a hundred were reported in eleven different years, with over forty in 1953 and over thirty in 1968. Since that date however, it has seldom been recorded. The four London records include one from 1953, two from 1968 and another in 1959. Abroad the moth occurs in the Mediterranean region and on the Atlantic seaboard of France. The only British record of the accent gem *Ctenoplusia accentifera* is from our area at Sevenoaks in 1969. Its origin is supposed to be north Africa, but no specific association with other immigrants at the time has been detected. The ni moth *Trichoplusia ni* is often associated with influxes of *Spodoptera exigua* and *Heliothis peltigera,* and particularly good years have been 1952, 1953, 1968 and 1982. There are six twentieth century London records, and an earlier one from 1896.

The slender burnished brass *Diachrysia orichalcea* is a tropical and sub-tropical species, found in the Canaries, Azores, Madeira, Africa and Asia. Skinner (1984) accepts fifty-one British records and includes three from Kent. It is not clear whether the specimen taken by J. F. Stephens in the mid nineteenth century, noted by Barrett (vi:102) in the London district is one of those three. None of the other records given by Skinner relates to our area and it is assumed that Stephens' capture is indeed amongst the Kent records. This is the only record for our area. Finally, the attractice rosy underwing *Catocala electa* has occurred twice in the region of the capital. There are only three other British records of this moth of the Mediterranean region, which also extends east to Japan. The similarity of this species to the common red underwing *C. nupta* will undoubtably conceal further records. At least one specimen, sadly an old, data-less museum specimen, on which I have examined the genitalia, was in fact not *nupta* as labelled in the drawer. However, in the apparent absence of published drawings of male genitalia of *electa* I was not able to decide to which species the moth was referrable. In the absence of data it is not possible to discover where in the world the specimen was collected, but the fact that it was morphologically identical to the remaining specimens which were indeed *nupta* serves as a caution.

Group 4. Species which would otherwise be placed in group 3 above, except that they are occasionally introduced, usually as larvae on imported produce, or are deliberately introduced or escape from captivity as adults

I have relegated five species to this group, in the form of two pyralids, two butterflies and a noctuid.

Pyralidae. Two specimens of *Maruca testulalis* were bred in 1967 from beans imported from Malawi. The first wild example of an adult in Britain was taken by myself at mv light in Wanstead Park, Essex on 26 August 1979, but this was thought to have originated as an imported larva or pupa. The second example, taken by Sir John Dacie at his garden light trap in Wimbledon, Surrey on 29 July 1983, coincided with reports of other rare migrants in Cornwall, and was beyond doubt a migrant itself. A similar history is found with *Daraba laisalis,* an African species which was first noted in Britain when a specimen was taken at light in the vicinity of Heathrow Airport during 1973. The location of the record gives immediate cause for suspicion. The second British example however, also in our area, was almost certainly a migrant. It was captured by Dacie at Wimbledon only eleven days prior to his capture of *M. testulalis,* on 18 July 1983. Although outside our area, it is of note that the third British example of this species was taken near Luton, Beds., only twenty-four hours after the capture of the Wimbledon *M. testulalis,* clearly indicating immigrant activity.

Lycaenidae. The long-tailed blue *Lampides boeticus* is a resident of much of the 'old world', although there are surprisingly few records for Britain. The best year was 1945, when thirty-one were reported, although only five of these related to the London area. In all, there are sixteen London records, of which two can be regarded as introductions, the rest as true immigrants. The most recent example was noted at the old Surrey Docks during 1980.

Danaidae. That classical migrant the monarch *Danaus plexippus* is extremely rare as a visitor to Britain, but is popular with butterfly breeders, (as indeed are a number of rather similar species), and as a result large number of the reported sightings undoubtedly relate to escapes. It remains unclear whether immigrants to Britain originate from American or Canary Island stock, but there are records of nine individuals, all between 1937 and 1982, which probably fit into this category.

Noctuidae. Prior to 1940, some one hundred examples of the scarce bordered straw *Heliothis armigera* were noted in Britain, twenty-eight of them in 1859. Since 1940, about 170 are recorded with records in most years but seldom in plenty. Numbers in excess of ten were recorded in only five years: 1950, 1956, 1969, 1978 and 1982. During September 1956 and October 1978, arrivals were associated with *C. puppillaria, O. obstipata* and *P. unionalis.* Interpretation of the records may be complicated by the frequent importation of larvae in tomatoes, carnations, chrysanthemums and other plants, (most collectors will know that the best way to get a series of good specimens of this moth is to get larvae from a greengrocer), but it is likely that most, if not all, wild caught adults originated as true immigrants. There are records of nineteen such examples in the London area, fifteen of which are recorded post 1940.

Group 5. Species whose status as immigrants in the London area is open to question

Section A. Species established as resident in recent years in the London area, probably as a result of earlier immigrations. Immigrations may still occur, but these are difficult to discern in most cases

No less than thirteen species are included in this section, as distinct from species which have been resident since at least 1900, (usually longer). The micro *Blastobasis decolorella* is now a locally common resident in the eastern sector of the London area, having established itself along the Thames as a result of immigration. Amongst the pyralids *Sitochroa verticalis* is now an extremely common moth of rank herbage and similar habitats throughout much of our area, particularly in the eastern sector. It is best found by distrubing suitable vegetation in June or July. It is also a suspected immigrant, but I have no records available for the London area which can be definitely attributed to immigration. Similar comments also apply to the European corn-borer *Ostrinia nubilalis* which is now abundant in certain areas, whilst *Evergestis extimalis* is yet another example in the same category. Another pyrale *Ancylosis oblitella* was formerly a rare immigrant which has been established on the salt-marshes in the Thames estuary since about 1956. Records for the London area are sparse, but it has been recorded on a number of occasions from Bushey, Herts. and Rainham, Essex in 1976, Enfield, Middlesex in 1976 and 1977, Aveley, Essex in 1983 and Grays, also Essex, from 1983 to 1985. It underwent a tremendous increase in population during the hot summer of 1976, but gradually died out in all areas in the next two or three years. It appears that the population may be resurging at present. The reference to the discovery of 'early stages' at Rainham in 1976 made by Goater in *Ent. Gaz.* **28:** 56 is apparently misleading, since the larval feedings noted could not positively be linked with this species, and the early stages of this moth in Britain remain unknown. Two tortricoids also qualify for inclusion in this group. *Ptycholomoides aeriferanus* was first recorded as British in 1951, but apparently did not appear in the London area until July 1963 when an example was taken at Buckingham Palace Garden. Later records available all herald from the two Essex vice-counties where it is a local and rather rare resident which is slowly spreading. The second species is *Lozotaeniodes formosanus,* whose immigrant activity is indicated by the regular capture of specimens at Bradwell, Essex and other coastal localities where the food plant, Scots pine, does not grow. It is still a rare moth in the majority of the London area, and there is no firm evidence that records relate to primary immigrants.

The yarrow pug *Eupithecia millefoliata* was first recorded in the London area in 1961 at Wimbledon, and whilst it is possible that this was an immigrant specimen, there is no supportive evidence available. In 1974 a singleton was captured in Buckingham Palace Garden, the first central London record. The moth is now well established in the eastern portion of our area, particularly in the vicinity of the Thames. Amongst the larger species, the white satin *Leucoma salicis* is abundant in the east of the London area, although less frequent in the west. It is reputed to visit us from aboard on occasions, but I have no definite immigrant records. The varied coronet *Hadena compta* established itself as a British resident possibly as a result of immigrations in the last hundred years or so, but in the London area was not recorded until 1962, when one was taken at West Norwood, Surrey. It is now locally established and expanding its range here. Certain records may however reflect immigration, although it is difficult to provide concrete evidence for this. For instance the moth was added to my already comprehensive list for East Ham, Essex during 1983, (since when it has occurred annually but only as singletons), on the same night that Mr J. Burge took his first example in the centre of Fulham. 1983 was, of course, noted for its immigrants. A similar story can be told of Blair's shoulder-knot *Lithophane leautieri.* First discovered in Britain on the Isle of Wight in 1951, the moth quickly established itself as a resident and set about spreading northwards, the larvae feeding on a variety of *Cupressus* spp. November 1972 saw the first London record at Totteridge, and the species is now firmly resident in a number of localities in London. A number of records from 1976 and several in 1983 may possibly be attributed to fresh immigrations, although as in the case of other species in this group there is a lack of supportive evidence. The stout dart *Spaelotis ravida* is a locally common resident in parts of our area and a suspected immigrant to Britain. There is at present no evidence to suggest that captures of moths in new areas of the London region are anything other than vagrants from local centres. Finally, we come to Vine's rustic *Hoplodrina ambigua,* added to the British list in 1879, but to the

London list much later. This is now an abundant species in some areas, and it is very difficult to decide whether any of the records relate to immigrants.

Section B. Species not yet established as residents in the London area

This is really a 'dump' category, since whilst there is no evidence to suggest that the records relate to immigrants, there is always the possibility that some might, and therefore the species concerned ought to be mentioned here rather than ignored. I have ignored however, records of species such as *Earis biplaga,* (a Kenyan species recorded at Buckingham Palace Garden at the time of a delegation from that country which visited the Palace), whose presence is positively attributable to artificial importation.

The tortricoid *Epiphyas postvittana* is indigenous to Australia and is apparently an adventitious species to Britain. In the London area there are but four records, from Grays, Essex, Charlton, Kent and Fulham, Inner London, all during the excellent immigrant year of 1983. The cypress or black-streaked pug *Eupithecia phoeniceata* was added to the British list by de Worms, who took an example at Penzance in 1959. The first London record was of a specimen at Orpington, Kent in August 1965, and it has subsequently been captured in the same locality during 1973, and in South Essex during 1981. These are the only records to hand at present, and it is unlikely that these relate to primary immigrants. The large thorn *Ennomos autumnaria* is a suspected immigrant to Britain, though all the London records are thought to reflect residency or internal spread. The sub-angled wave *Scopula nigropunctata* is a resident of Ham Street, East Kent, for which there are two London records, whilst the tawny wave *S. rubiginata* is confined to the Breck and coastal sandhills in Suffolk, and has been reported in London once only in 1890. The dusky marbled brown *Gluphisia crenata* is only doubtfully admitted to the British list, on the strength of three examples, two of which were from Ongar Park Wood, Essex in 1839 and 1840. There is a single record of the apollo butterfly *Parnassius apollo* for our area, from Tavistock Gardens, Inner London in 1957. This may or may not have been a true immigrant example. The only two London records of the Kent black arches *Meganola albula* may relate to immigrants, although the species is resident in Britain. Only slightly better represented in our area is the Portland moth *Ochropleura praecox* with three records. The insect is a rare resident of coastal sandhills and sandy heaths. The dotted rustic *Rhyacia simulans* is a recent colonist in our area which is spreading rapidly. It was not noted in the London area until 1978, when three were taken at Ingrave, Essex, but these and subsequent records doubtless relate to insects from further south in this country rather than to foreign immigrants. The l-album wainscot. *Mythimna l-album* was first recorded in Devon in 1901 and was a rare immigrant until the 1930s when it became established in the west country. There is a single London area record of one at Claridges Hotel, Inner London in 1969, but this is unlikely to have arrived here unaided. The toadflax brocade *Calophasia lunula* is a resident of south coast shingle beaches, particularly in the Dungeness region. Its inclusion in this list is on the basis of a larva found near Dartford in September 1952, which may have been the result of a visit by an immigrant earlier in the year, and a worn adult taken at a light trap in the same general area in June 1953. Whilst the moth is a possible immigrant to Britain, these two examples probably relate to south coast wanderers. The flame brocade *Trigonophora flammea* was established, as a result of immigration, from at least 1855 to 1892, thereafter occurring as a scarce immigrant. On the strength of this an undated record from Harrow Weald, published in 1895, probably does not relate to a genuine immigrant. The red-headed chestnut *Conistra erythrocephala* was resident in Britain between the first British capture in 1847 to about 1880, after which it became extremely rare. Post-1900 records reflect immigration only and in the London area the two records I have traced herald from St Albans, Herts. in 1866 and from Darenth Wood, Kent in 1872. Abroad the moth is native in western Europe from Spain to southern Sweden. The scarce dagger *Acronicta auricoma* appears to have been a scarce resident in the south-east for much of the last century, thereafter occurring only as a visitor. The London records available are all from the last century, and probably all relate to residents. The spotted sulphur *Emmelia trabealis* was resident in the Brecks until about 1930, after which it became rare and was probably extinct by 1961. Our five London records all relate to the last century, and may refer to immigrants. Finally, we have the olive crescent *Tristateles emortualis*. A scarce resident known from less than ten sites in Britain, all in the south-east, it was noted twice in the London area – in 1859 and 1870.

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APPENDIX

Records of immigrant Lepidoptera in the London area.

For each species the name is given first followed by a coded statement of its status as follows: I = immigrant species; V = vagrant species from elsewhere in Britain; R = resident species; A = accidentally introduced or released. Combinations of these codes are used as appropriate. Status in Britain as a whole is given first, prefixed B–, followed by its status within the London area, prefixed L–. This is followed by a note of the vice-county numbers of the London area where the species has been recorded as an immigrant or suspected immigrant as follows: 16 = West Kent; 17 = Surrey; 18 = South Essex; 19 = North Essex; 20 = Hertfordshire; 21 = Middlesex; and 24 = Buckinghamshire. The word 'All' indicated that the species is recorded from all seven vice-counties in the London area. The total number of immigrant/suspected immigrant examples recorded for the London area is then summarised first for the period prior to 1900, then for 1900 to 1949, and finally for 1950 to 1985. A record of larvae, indicating an earlier visit by a possible immigrant counts as a single record. Details of the London area records are then given, with references in the text. The author would be pleased to receive details of additions or corrections to this list, in which a number of corrections are made to the dates of records published by de Worms in this journal.

Yponomeutidae
Plutella xylostella L. B-I,R; L-I,R. All.
Numerous as a resident and immigrant; Records not enumerated.

Tortricidae
Epiphyas postvittana Walk. B-Adv, ?R; L-?Adv,?I. 16,18,21. 0:0:4.
Charlton (16) 1.vi.1983 (Allen); Fulham (21) 26.vi.1983 (Burge); Charlton (16) 7.vii.1983 (Allen); Grays (18) 17.viii.1983 (Agassiz).

Pyralidae
Udea ferrugalis Hb. B-I,R; L-I,?R. 16,17,18,21. Records not enumerated.
Numerous as an immigrant in certain areas in most years.
Nomophila noctuella D.&S. B-I; L-I. All. Records not enumerated.
A common immigrant in most years.
Maruca testulalis Geyer B-I,A; L-I,A. 17. 0:0:1.
Wimbledon (17) 29.vii.1983 (*Lond. Nat.* **60:** 101); Wanstead Park (18) one at actinic light on 26.viii.1979 was probably not an immigrant (Plant).
Diasemiopsis ramburialis Dup. B-I; L-I. 17,20. 0:0:2.
Arkley (20) 22.ix.1961 (Bretherton, pers. comm.); Camberwell (17) 12.vii.1967.
Palpita unionalis Hb. B-I; L-I. 16,17,18,20,21. 0:0:21.
Feltham (21) 23.vii.1955 (Classey); Weybridge (17) 20.viii.1955 (Messenger); New Haw (17) 5 on 24.viii.1955 (Best); Pinden (16) 6.xi.1958 (*Entom.* **91:** 176); Arkley (20) 10.x.1959 (French); Blackheath (16) 11.x.1959 (French); Westerham (16) 10.viii.1961 (*Ent. Gaz.* **96**); Wotton (17) 24.x.1977 (Bretherton per J. D. Holloway); Herne Hill (17) a worn male in a train 4.ix.1980 (Bretherton); Grays (18) 1.vii.1982 (Agassiz); West Wickham (16) 15.ix.1982 (Bretherton) and 17.ix.1982 (Chalmers-Hunt); Buckland (17) female on 12.x.1982, male on 21.x.1982; North Cheam (17) 16.ix.1982 (McCormick); Wimbledon (17) a male on 17.ix.1982 (Dacie); Egham (17) 3.x.1983.
Daraba laisalis Walker B-I,A; L-I,A. 17 0:0:1.
Wimbledon (17) 18.vii.1983 (Dacie).
Ancylosis oblitella Zeller. B-R,I; L-R,?I. 18,20. 0:0:? (see text).
Rainham (18) 27.vii.1976 abundant in cabbage field on saltings, and Bushey (20) on 12.viii.1976 and 20.ix.1976 (*Ent. Gaz.* **28:** 56); Enfield (21) several during the course of 1976, less in 1977, then gradually dying out here (Agassiz, pers. comm.); Aveley (18) 18.vii.1983; Grays (18) a few in 1983, more in 1984 and again in 1985 (Agassiz, pers. comm.).

Papilionidae
Papilio machaon L. ssp. *bigeneratus* Verity B-I; L-I. 16,17,21. 0:5:1.
Enfield (21) 17.viii.1911 (*Entom.* **44:** 365); Oxted (17) 1934 (*Entom.* **67:** 205); Richmond (17) 29.vi.1935 (*Entom.* **68:** 211); Orpington (16) 1945 (de Worms); Hayes (21) 31.v.1949 (*Entom.* **82:** 184); Bexleyheath (16) 28.viii.1962 (*Ent. Rec.* **74:** 246).

Individuals of unspecified race are reported from Surrey Docks (17) 2.vii.1982 (Murdoch) and Walthamstow (18) vii.1984 (Jacobs).

Pieridae

Colias hyale/australis B-I; L-I. 16,17,18,21. 1:>65:5.

Lee (16) vii.1868 *(Ent. Rec.* **18:**); Epsom (17) 27.viii.1945 (Buckstone); Harrow (21) 4.x.1945 (Chester); Surbiton (17) a female on 11.vii.1946 (Stallwood); Box Hill (17) 3 on 10.vii.1946 (Stallwood); Joydens Wood (16) 1947 (Owen); Eynsford/Shoreham area (16) 53 in 1947 (Owen); Walton (17) a female on 4.x.1947 (Messenger); Worcester Park (17) 6.x.1947 male on marigold blossoms (*Entom.* **80:** 271); Lewisham (16) 27.viii.1948 (Owen); Dartford Marshes (16) ix.1948 (Owen); Eynsford (16) a male on 30.v.1948 (Lansbury); Walton (17) a male on 27.viii.1949 (Messenger); Bookham (17) 9.vii.1956 (*Entom.* **90:** 234); Upminster (18) 3 on 2.ix.1964 and 1 on 5.ix.1964 (*Ent. Rec.* **76:** 243).

Colias croceus Geoff. B-I; L-I. All. Records not enumerated, but several hundreds in each date band. Records for the 1983 immigration were summarised in Plant (1984). Particularly good years during the present century for this species in London have been 1947, 1967 and 1983. Lower numbers have occurred in most other years with a few exceptions. Records include: 1941: 1 at Cuffley (20). 1943: Claygate (17). 1944: Harrow (21). 1945: Lewisham and Greenwich (16). 1946: Ealing, Hayes (21) and Caterham, Croydon and Wimbledon (17). 1947: Oxshott and Surbiton (17) 57 at end of July; Richmond Park (17); Cripplegate, St James's Park, Fetter Lane (21); Chislehurst (16) 740 in a seven-mile radius including 50 f. *helice;* Greenwich, Petts Wood (16). 1966: Chesington (17). 1967: '1967 was a good year' (de Worms 1950). 1969: Thorpe (17). 1970 1 at Hayes (21) on 3 August; 1979: 1 at Rye Meads (20) on 26 August. 1981: 1 at Rye Meads on 22 August.

Pieris brassicae L. B-I,R. L-I,R. All? Records not enumerated.

The problems involved in distinguishing genuine immigrants are immense. An apparently large immigration on a narrow front was detected on the south coast in June 1970, and this was also picked up in several London suburbs including Hampstead (21) [R. A. Softly, pers. comm.].

Pieris rapae L. B-I,R. L-I,R. All? Records not enumerated.

There is some evidence of greater autumn numbers in London in years when immigration activity generally is high. However, there are no records which can be positively attributed to immigrants.

Pontia daplidice L. B-I; L-I. 16,17,20,21. 1:14:0.

Addington (17) 1894 (Browning); Watford (20) a male on 27.v.1918 (Dudley); Epsom Downs (17) a female on 15.vii.1945 (Martin) and another here on 17.vii.1945 (Maxwell); Tattenham Corner (17) 20.vii. and 23.vii.1945 (*Entom.* **78:** 143); Hounslow (21) 8.viii.1945 (*Entom.* **78:** 143); Wrotham to Eynsford (16) 7 on the Downs at end vii.1945 (*Entom.* **78:** 143); Feltham (21) 21.iv.1946 (Classey). Note the early date of Classey's record. The source of the un-referenced records is the review by Danreuther in *J. Soc. Brit. Ent.* **3**(1): 5-7.

Lycaenidae

Lampides boeticus L. B-I,A; L-I,A. 16,17,21. 2:6:6.

Dartford (16) 7.ix.1893 (*Entom.* **26:** 301); Woolwich (16) one in a house on 29.ix.1898 (de Worms 1950); Greenford (16) a worn specimen on 24.vii.1945 (*J. Soc. Brit. Ent.* **3:** 8-9); Epsom Station (17) 4 on 27.viii.1945 (*Entom.* **78:** 157); Streatham (17) 7.ix.1949 (Ayres); Wimbledon Common (17) a perfect male on 3.x.1950 (*Entom.* **84:** 47); Finchley (21) 18.x.1967 (French); Wisley (17) 4.ix.1971 (*Ent. Rec.* **83:** 326); Eltham 15.ix.1974 (Palmer); Surbiton (17) 29.vii.1977 (*Lond. Nat.* **57:** 84); Surrey Docks (17) 26.viii.1980 (Murdoch). Probable importations are: Sutton (17) one in a house on 15.ix.1979; and Heathrow Airport (21) one in the cargo area on 16.ix.1980, later released on the south coast at Portland Bird Observatory where it promptly laid eggs.

Nymphalidae

Vanessa atalanta L. B-I; L-I. All. Numbers not enumerated.

Common in most years, with particular abundance in 1966, 1968, 1969, 1973, 1976, 1980 and 1983. Particularly poor years have included 1961, 1970 and 1984.

Cynthia cardui L. B-I; L-I. All. Numbers not enumerated.

Common in most years, the periods of abundance and scarcity in our area coinciding always with *V. atalanta,* with the exception of 1973 when *atalanta* was abundant in the autumn but *cardui* was quite scarce.

Nymphalis polychloros L. B-I,?R. L-I. 16,17,18,20,21. 0:22:10.

Streatham Station (17) 1901 (Paton, C. I., and Paton, C. R. MS in coll. Manx Museum, information via Dr L. S. Garrad); Cleveland Square (21) 2.v.1917 (*Entom.* **50:** 142);

Kingston (17) 16.v.1918 (*Entom.* **51:** 161); Chipstead (17) 1942 (de Worms 1950); Lewisham (16) pair on a bombed site in vii.1944, and Broxbourne (20) 11.vii.1944 (de Worms 1950); Lewisham (16) 1 on same bombed site as 1944, on 29.iii.1946 (de Worms 1950); Ewell (17) a male on 5.vii.1946 (*Entom.* **79:** 90); Claygate (17) 13.iv.1947; Hayes Common (16) 24.v.1947; Lewisham, one on same bombed site as 1944 and 1946, on 27.vii.1947; High Barnet (21) iii.1947 (all de Worms 1950); Bookham Common 27.iii.1948 (*Lond. Nat.* 1954); Hayes Common (16) 2.iv.1948; Farningham Woods (16) 11.iv.1948; Lewisham (16) 11.iv.1948; Stanmore (21) 21.iv.1948; West Croydon (17) 23.vii.1948 (Wild, *Croydon Survey*); 30.vii.1948 Grove Park (Hyatt); Betchworth (17) 9.iv.1949; Esher (17) iv.1949 (all de Worms 1950); Whippendell Woods (20) one in the 1950s; Hoddesdon Park Wood (20) one in the 1960s; near Burnt Farm (20) iv.1972 (all via Herts. Biol. Rec. Centre); Charlton (16) early vi.1975 (*Ent. Rec.* **89:** 316); Gordon Square, Inner London (21) 15.ix.1977 (Lyle); Hayes (16) 15.vii.1982 (via Bretherton); Beckenham (16) 29 and 30.vii.1982 (via Bretherton); Radlett (20) a very fresh adult on 29.v.1983 (Wildridge); Wanstead Park (18) one at bramble flower on 14.vii.1985 (Mallet); nr. Rickmansworth (20) 21.vii.1985 (Anderson, per. A. M. George).

Nymphalis xanthomelas D.&S. B-I; L-I. 16. 0:0:1.

Borough Green (16) a female on 2.vii.1953 (Miss C. A. MacDermott *Proc. Trans. S.L.E.N.H.S.* 1953/54: 35 and plate 1, fig. 1). First British record.

Nymphalis antiopa L. B-I,?R; L-I,?R. 16,17,18,20,21. 0:20:>39.

Claim to residency in London rests with a singleton hibernating under some logs in a garden at Stanmore (21) on 15.ii.1948. However, whether or not hibernation was successfully completed remains unclear. Other records available are St Albans (20) one in 1900 (Herts. N.H.S. xiv: 237); Hatfield (20) one in x.1900 (Foster, *Lep. Herts.* 1937); Raynes Park (21) 29.viii.1904 (*Entom.* **38:** 91); Harrow (21) 27.vii.1905 (*Entom.* **38:** 283); Enfield (21) and Broxbourne (20) 1909 (*Entom.* **42:** 282); Weybridge (17) 5.iii.1910 (*Entom.* **43:** 119); Chelsfield (16) viii.1910 (*Entom.* **45:** 209); Addiscombe (17) 22.ix.1915 (*Entom.* **48:** 267); Oxshott (17) 2.viii.1917 (*Entom.* **50:** 235); Reigate (17) 25.ix.1924 (*Entom.* **57:** 282); Dulwich Park (16) 2.ix.1928 (*Entom.* **61:** 236); Beckenham (16) 1930 (*Entom.* **63:** 14); North Weald (18) 7.viii.1932 [incorrectly given in de Worms (1950) as 7.viii.1931] (*Entom.* **65:** 258); Ashtead (17) a female on 25.v.1935 (*Entom.* **68:** 15); Harrow (21) 24.ix.1938 (de Worms 1950); Hendon (21) 23.iv.1940 (*Entom.* **73:** 161); Edgware (21) 16.vii.1943 (*Entom.* **76:** 170); Finsbury Square (21) 3.iix.1954 (*Entom.* **87:** 220); Chingford (18) 7.ix.1945 (R. D. Weal in letter at Passmore Edwards Museum); Kensington (21) early viii.1967 (de Worms 1969); Osterley/South Harrow (21) 31.viii.1970, possibly an escape or a release (*Ent. Rec.* **83:** 153 and *Bull. A.E.S.* **30:** 126); Ingatestone (18) 22.ix.1971 (Firmin *et al.*, p.30); Regent's Park (21) 22.vii.1973 and Keston (16) 31.vii.1973 (*Ent. Rec.* **85:** 269); Forest Hill (16) 13.ix.1974, possibly another escape, (*Ent. Gaz.* **26:** 152); Brentford High Street (21) 9.vii.1976; Northwood (21) 21.viii.1976; Ingrave (18) 23.viii.1976; Middle Wood, Shoreham (16) 23.viii.1976 (*Ent. Rec.* **88:** 255); Richmond (17) 23.viii.1976; Kew Gardens (17) 24.viii.1976, (possibly the same individual as the preceding record); Dulwich (16) 27.viii.1976; Regent's Park (21) late viii.1976; Banstead Heath (17) end of viii.1976; Dartford (16) first week of ix.1976; Dulwich (16) 3.ix.1976; Carshalton (17) 3.ix.1976 (*Ent. Rec.* **88:** 264); Wormley (20) 3.ix.1976 on rotten apples (Lady Rawleigh in *The Times*); Loughton (18) 7.ix.1976; Orpington (16) 7.ix.1976 (*Ent. Rec.* **88:** 293); Ealing (21) 10.ix.1976; Digswell (□) 26.ix.1976 and again on 17.x.1976; Orpington (16) on the late date of 10.xi.1976; Netlcy Heath (17) 27.iv.1977, possibly overwintered from 1976 (*Ent. Rec.* **89:** 340); Northwood Golf Course (21) 27.viii.1977 (*Ent. Rec.* **89:** 348); Orpington (16) 7.ix.1977 (*Ent. Rec.* **89:** 348); Shoreham (16) 26.vii.1979, in a garden; South Croydon (17) 15.viii.1981 (*Ent. Rec.* **93:** 241); Kew Gardens (17), one in the Jodrell Laboratory on 25.viii.1981; Epping town centre (18) 14.vii.1983; Roding Valley Recreation Ground, Loughton (18) late vii.1983; Euston Road, N.W. (21) 27.x.1983; Grange Park (21) 25.ix.1984 (*B.E.N.H.S. exhib.* 1984); Hailey Lane (20) 29.ix.1984 (via Herts. Biol. Rec. Centre); Isle of Dogs (21) one in 1984 (Murdoch). Most of the unreferenced 1976 records are from de Worms (1950).

Argynnis lathonia L. B-I; L-I. 16,17,20. 1:2:2(?3).

Darenth Wood (16) 1868 (*Entom.* **4:** 131); Warlingham (17) 30.ix.1934 (de Worms 1950); Sutton (17) 17.viii.1943 (*Entom.* **78:** 21); Radlctt (20) 1975 (Wildridgc); Symondshydc Great Wood (20) a possible in 1976 (*Trans. Herts. N.H.S.* 1977 p.31); Chiswell Green (20) 29.v.1982 (Walton). The last three records received via Herts. Biol. Rec. Centre.

Danaidae

Danaus plexippus L. B-I,A; L-I-A. 17,18,21. 0:1:8.

Harrow (21) 2.x.1937 (de Worms 1950); West Wickham (16) 22.viii.1950 (*Ent. Gaz.* **2:** 75); Norbury (17) 25.ix.1957 (*Entom.* **90:** 351); Godstone (17) one each on 21.x. and

29.x.1967; New Cross (17) 24.x.1968 (*Entom.* **106:** 260); Oxted (17) 19.x.1973 (*Ent. Rec.* **94:** 146); Epsom (17) a male on 11.ix.1977 (*Ent. Rec.* **91:** 27); Loughton (18) late vii.1982 'identified from a book' (*Ent. Rec.* **95:** 144).

The following records relate to escapes or releases: Tilbury Docks (18) two flew from a ship in 1920 (*Entom.* **54:** 145); Eltham (16) 15.ix.1974 (*Ent. Gaz.* **26:** 28); Kew (17) several on 10-15.viii.1981; Chislehurst (16) 1983 (*Eltham and Kentish Times* for 15.vii.1983).

Geometridae

Aplasta ononaria Fuessly B-R,I; L-I. 16. 0:1:0.

Westerham (16) one at light in viii.1947 (C.-H. Kent **3:** 3).

Cyclophora puppillaria Hb. B-I; L-I. 16,17,18,20,21,24. 0:0:13.

Otford (17) 22.viii.1955 (*Entom.* **89:** 121); Kingsbury (21) 12.x.1959 (Myers); Wimbledon (17) 16.x.1959 (*Ent. Rec.* **72:** 22); Chalfont St Peter (24) a female f. *badiaria* Stdgr. at m.v.l. on 25.ix.1957 (*Ent. Gaz.* **9:** 44); Nutfield (17) 8.x.1969 a female at m.v. light (Croydon Survey: 306); Lee (16) 20.x.1969 (Bruce); Totteridge (20) 22.x.1969 (Lorimer); Nutfield (17) 8.x.1969 (via Bretherton); Tattenham Corner (17) 30.ix.1967 (Wallis); Addiscombe (17) a male on 8.x.1976 (*Ent. Rec.* **89:** 83); West Wickham (16) a female on 30.vii.1976 (*Ent. Rec.* **88:** 267); Croydon (17) x.1977 (Evans); East Tilbury (18) 1983 (Emmet and Pyman 1985).

Rhodometra sacraria L. B-I; L-I. All. 8:>13:>200.

Highgate and Uxbridge (21) 1878 (Cockerell, *Lep. Middx,);* Chingford (18) viii.1899 (South vol. 2); Plumstead (16) 1868 (*Ent. Annual* 1868); Clapham Common (17) 1859 (*Ent. Annual* 1860); Banstead (17) 1863 (*Ent. Annual* 1864); Dulwich (17) undated prior to 1900 (*V.C.H.* 1902); Regent's Park (21) 1865 (*Barrett* **8:** 218); Pinden (16) ix.1940 (Hare); between Eynsford and Shoreham (16) 24 in clover fields from 17.ix. to 19.x.1947 (*Bull. A.E.S.* **7:** 197-198); Blackheath (16) 19.ix.1947 (Owen); West Wickham (16) 35 disturbed in a stubble field by day 27-29.ix.1947 (Chalmers-Hunt and Cope); Westerham (16) 14 noted in 1947 (C.-H. Kent); South Kensington (21) 1947 (de Worms 1957); Ruislip (21) undated in de Worms (1957); Eynsford (16) two in ix. and x.1947 (Hyatt); Blackheath (16) two in ix.1947 (Hyatt); Pinden (16) several in 1947 (Hare); Nonsuch Park, Cheam (17) two in ix.1947 (Wild); South Croydon (17) 1947 (Wild); Westerham (16) 1948 (Edwards); Bedfont (21) 31.viii.1950 (Kindred); Weybridge (17) 31.vii.1951 (Messenger); Pinden (16) a few in 1953 (Hare); Totteridge (20) 3.x.1956 (Lorimer); Weybridge (17) 11.x.1956 (via Bretherton); Pinden (16) 16.viii.1958 (*Entom.* **91:** 175); Chalfont (24) 6, 7 and 13.ix.1958; Ashtead (17) 13.ix.1958; Byfleet (17) 14.ix.1958 (the last three via Bretherton); Finchley (21) 13. ix.1958 (Johnston); Ruislip (21) 3 in 1958 (Minnion); Pinden (16) 16.viii.1958 (Hare); Arkley (20) 31.viii and 23.ix.1961 (*Ent. Gaz.* **96:** 37-38); Pinden (16) two in last week of x.1963 (Hare); Scratch Wood (21) 17.vii.1964 (Myers); Pinden (16) 4.ix.1964; Lee (16) 9.ix.1964 (Bruce); Wimbledon (17) a male on 11.ix.1966 (Dacie); Sydenham (17) 19.ix.1966 (*Entom.* **104:** 211); Rainham (18) 2.ix.1968; Byfleet (17) 31.x.1968; Rainham (18) 2.ix.1969; Kensington (21) x.1969 (de Worms); Queen's Gate, Kensington (21) x.1970; Cheam (17) 27.viii.1971 (Ashby); Thorpe (17) 9.ix.1973 (Baker); Symondshyde (20) mid-ix.1973 (Herts. Biol. Rec. Centre); Addiscombe (17) 9.x.1978; South Norwood (17) a male f. *atrifasciana* 9.x.1978; Purley (17) 11.x.1978; Totteridge (20) 11.x.1978; Coxtie Green (18) 11.x.1978; South Croydon (17) a male on 15.x.1978 (Skinner); Selsdon (17) 21.x.1978; Doddinghurst (18) 1.ix.1979 (Smith); Rainham (18) 9.ix.1979 (*Ent. Gaz.* **31:** 228); Bexley (16) 11.ix.1979; Totteridge (20) 9.x.1979; Croydon (17) 13.viii.1980 (Evans); Selsdon (17) 15.viii.1980; Addiscombe (17) 11 and 26.ix.1981; Tilbury (18) 8.x.1981 (Penney); Grays (18) 8.ix.1982 (Agassiz); Welwyn (20) 18.ix.1982 (Waterton); South Croydon (17) a female on 20.ix.1982 (Skinner); Croydon (17) two on 25.ix.1982 (Evans); Ickenham (21) 26.ix.1982 (Weaver); St Mary Cray (16) a male on 28.ix.1982; Buckland (17) 28 and 29.ix.1982, both males; Thorpe (17) iv.1983 and viii.1983 (Baker); South Croydon (17) 1.viii, 9.ix. and 24-29.ix.1983, a total of seven (Skinner); Orpington (16) 1983 (Sokoloff); Bromley Common (16) 26.viii.1983 (Birchenough); Addington (17) 14 from 23-30.ix.1983 (Skinner); Putney (17) 1 on 1.x.1983 (Sealey); Grays (18) 29.ix, 1.x. and 2.x.1983, one on each date (Agassiz); Wimbledon (17) 24.ix, 27.ix. and 28.ix, one on each date and two on 1.x.1983 (Dacie); Addington (17) 23-30.ix.1983 a total of twelve (Skinner); Buckland (17) a total of eleven in ix. and x.1983 (Hart); Mitcham (17) seven from 26-29.ix.1983; Dartford (16) a male on 4.viii.1984 (West); Coxtie Green (18) 2.ix.1984 (Wanstall); Hampstead (21) 3.ix.1984 (Softly); Reigate (17) 23.ix.1985 (Hart); Hampstead Garden Suburb (21) 20.ix.1985 (Lowe); Orpington (16) 1 on 30.ix.1985 (Sokoloff).

Orthonama obstipata Fabr. B-I; L-I. 16,17,20,21. 6:8:>40.

Hampstead (21) 1868 (de Worms 1957); Greenhithe, Lee, Eltham, Charlton and West

Wickham (16) pre-1900 (*V.C.H.* 1908); Waltham Cross (20) 1904 (Foster, *Lep. Herts.* 1937); Blackheath (16) 1906 (West, *Ent. Rec.*); Highgate (21) 1912 (*Ent. Rec.* **24:** 306); Stanmore (21) 7.xi.1937 (*Entom.* **70:** 286); Westerham (16) 1942 and 1947 (Edwards); Orpington (16) 1948 (Swain); Chertsey Meads (17) 2.x.1948 (Bretherton); Greenford (21) 27.vii.1950 (Ward); Tadworth (17) 1.viii.1951 (Wheeler); Putney (17) two in vi.1952 (Swain *Ent. Gaz.* **6:** 58); Croydon area (17) about a dozen in 1952 (*Croydon Survey:* 309, 310); Weybridge (17) 1952, 1953 and 1956 (*Ent. Rec.* **90:** 235); Wallington (17) 9.ix.1955 (French); Finchley (21) 25.viii.1959 (Johnston); Whetstone (20) two in x.1959 (Ward); Arkley (20), 1959 (Howarth); Epsom (17) two in vii.1959 (Tunstall); Wimbledon (17) a male on 20.vii.1960, and a female on 19.vi.1961 (Dacie); Mill Hill (21) 9.ix.1961 (Goater); Buckingham Palace Garden (21) xi.1961 (*Proc. Trans. B.E.N.H.S.*, 1964); Totteridge (20) one in 1966 (Lorimer); Bushey (20) one in 1967 (Goater); Camberwell (17) 12.vii.1967 (Bretherton, *Pers. Comm.*); Bexley (16) 17.vii and 16.viii.1967 (Bretherton *Pers. Comm.*); Wimbledon (17) a male on 14.viii.1969 (Dacie); Buckingham Palace Garden (21) one in 1969 (de Worms 1972); 1969 – de Worms, in *Lond. Nat.* **49:** 82-89, states that there were many records for the area this year including nine in Herts. (20) but gives no details for most of these. The following records are all supplied by Bretherton: West Norwood (17) 11.ix.1968; Selsdon (17) 2.xi.1978; Betchworth (17) 28.v.1981; Orpington (16) 2.x.1982; Charlton (16) a female on 4.vi.1983 and a male on 17.vi.1983 (*Ent. Rec.* **96:** 82).

Eupithecia millefoliata Rossl. B-R,?I; L-R,V. 17,?21. 0:0:?

Wimbledon (17) 16.vii.1961 – first record for L.N.H.S. area (Dacie). There is no evidence to support the theory that any London records of this species are primary immigrants.

Eupithecia phoeniceata Ramb. B-R,I; L-?R. 16,18. 0:0:3.

Orpington (16) one on 30.viii.1965 (Watkinson, *Ent. Rec.* **86:** 26), and one on 6.ix.1973 (Sokoloff); Tilbury (18) 16.ix.1981 (Penney). It is unlikely that these records relate to immigrant examples.

Semiothisa brunneata Thunb. B-R,I; L-I. 17,24. 1:0:2.

Bexley (16) an imago taken by L. T. Ford about 1896 (C.-H. Kent); Wimbledon (17) a male on 25.vi.1960 (Dacie); Chalfont St Peter (24) one on 27.vi.1960 (Ansorge).

Sphingidae

Agrius convolvuli L. B-I; L-I. All. 0:>35:>33.

Eltham (16) 1906 (Canon Edwards); Enfield (21) 1925 (Eagles); Wembley (21) 1935 (Classey); Bromley (16) 1941 (Bretherton); Morden (17) a female on 1.ix.1943 (Craske); Godstone (17) 10.ix.1943 (Craske); Dartford (16) 6 and 8.ix.1945 (*Entom.* **79:** 20); Hammersmith (21) 31.viii.1945 (*Entom.* **79:** 96); Malden (17) viii.1945 (*S.L.E.N.H.S.* **8:** 49); Reigate (17) twelve in 1945 (*Entom.* **79:** 104); Pinden (16) 1945 (Hare); Morden Hall (17) 1945 (Nott); 'London' 1946 (*Entom.* **80:** 110-111); Reigate (17) eight on 6.ix.1947 (*S.L.E.N.H.S.* **8:** 26); Croydon (17) 22.ix.1947 (*Croydon Survey:* 342); Ashtead (17) a male on 24.ix.1948 (Matthews); Caterham (17) 24.ix.1948 (Welti, *Croydon Survey*); Claygate (17) a male in 1950 (Stallwood); Regent's Park (21) two in 1950 (Bushby); Mill Hill (21) ix.1950 (Ellis); Pinden (16) 1950 (Hare); Bromley (16) 1951 (Trundell); Carshalton (17) 25.vi.1952 (Booker); Whetstone (21) a female on 18.viii.1952 (*Entom.* **85:** 221); Arkley (20) 30.viii.1952 (Howarth); Plumstead (16) one in 1952 (Showler); Weybridge (17) 29.viii.1952 (Messenger); Arkley (20) 12.x.1953 (Howarth); Westerham (16) 14.ix.1953 (Edwards); Mill Hill (21) a female on 23.ix.1955 (Goater); Arkley (20) 20.ix.1956 (Howarth); Wood Green (21) 30.ix.1956 (*Entom.* **90:** 67); Arkley (20) 27.iii.1957 (*Entom.* **90:** 27); Westerham (16) 18.ix.1958 (Edwards); Feltham (21) 25.ix.1960 (*Ent. Gaz.* **11:** 203); Chalfont St Peter (24) 5.ix.1964 (Ansorge *Lep. Bucks.*); Hook Heath (17) 30.viii.1964; Girous Grove (17) 13.ix.1964 (*Croydon Survey:* 342); Coulsdon (17) 9.ix.1970; West Wickham (16) 10.xi.1973 a male found in a shop (*Ent. Rec.* **86:** 9); Selsdon (17) 28.viii.1976 (*Proc. Trans. B.E.N.H.S.* **10:** 6); Bletchingley (17) 23.ix.1973 – on a door (*Ent. Gaz.* **25:** 28); Reigate (17) a gravid female 16.ix.1973 (*Ent. Rec.* **89:** 269); Ingrave (18) ix.1976 (Grimwood); Dartford (16) a male on a gate post on 30.ix.1982 (West); Tolworth (17) 27.ix.1983 (J.P.); Putney (17) 1.x.1983 (D.L.F.S.); Dartford (16) a female on 30.ix.1984 (West).

Undated records include: Finchley (21), Whetstone (21), Brentwood (18), Caterham (17) and West Wickham (16) [all de Worms 1954]; and East Barnet, Cheshunt Street, Watford and Broxbourne (Foster *Lep. Herts.* 1937).

Acherontia atropos L. B-I; L-I. 16,17,18,20,21. 1:>8:>40.

Parliament Street, Inner London (21) 1875 (*Entom.* **8:** 225); Shepperton (17) 1901 (*Ent. Rec.* **13:** 277); Sydenham (17) 1.ix.1939 (Trundell); Croydon (17) 1943 (Bretherton pers. comm.); Leytonstone (18) 22.x.1943 (*Entom.* **78:** 48); The Strand (21) 1948 (de Worms

1954); Bexley (16) vi.1950 (Craske); Pinden (16) ix.1951 (Hare); Weybridge (17) 28.xi.1951 (via Bretherton); Northaw (20) ix.1952 (Odell); Pinden (16) ix.1952 (Hare); Potters Bar (20) 20.ix.1952 (*Entom* **86:** 158); Westerham (16) ix.1953 (Edwards); Pinden (16) v.1953 (Hare); Watford (20) 29.ix.1956 (*Entom.* **89:** 301); Arkley (20) 10.ix.1956 (Howarth); Wood Green (21) 30.ix.1956 (*Entom.* **89:** 69); Loughton (18) 24.ix.1956 (Willingale); Weybridge (17) a male on 11.ix.1956 (Messenger); Staines (21) late vi.1956 (*Entom.* **90:** 229); Weybridge (17) 24.xi.1956 (Messenger); Regent's Park Zoo (21) and Barbican (21) 1956 (*S.L.E.N.H.S.* **55:** 15); Tadworth (17) 7 and 13.vii.1960; Feltham (21) 25.ix.1960 (*Ent. Gaz.* **11:** 203); Westerham (16) 1961 (*S.L.E.N.H.S.* **61:** 32); Dartford (17) ix.1968; Walton (17) vii.1969 (*Lond. Nat.* **49:** 84); West Wickham (16) one dead on 7.x.1069 (*Ent. Rec.* **82:** 336); Norbury (17) 14.x.1969; Enfield (21) 7.ix.1973 (*Ent. Gaz.* **25:** 28); Warlingham (17) a fresh male on 17.ix.1973 (*Ent. Gaz.* **25:** 30); Upminster (18) 1.x.1973 (*Ent. Rec.* **86:** 51); Putney (17) one on Jasmine in viii.1976 (Delay); St Albans (20) early ix.1976 (*Trans. Herts N.H.S.* **28:** 291); Tolworth (17) a male in 1978 (via Bretherton); Plaistow (18) one dead in street in ix.1979 (Plant); Thorpe (17) 31.viii.1980 (*A.E.S. Bull.* **40:** 15); Wandsworth (17) 7.ix.1982 (Messenbird); Islington (21) 15.viii.1983 (Grant via Bretherton); Higham (16) 1984 (via Bretherton).

There are undated records from Lambeth Palace (17), Potters Bar (21), and Ewell (17), all from de Worms (1954); St Albans, Watford, Barnet, Haileybury, Cheshunt, and Broxbourne, all from Foster (*Lep. Herts.* 1937).

There are records of larvae from Regent's Park Zoo (21) in viii.1951; Hounslow (21) and Claygate (17) – undated in de Worms 1954; Surbiton (17) in 1948 (Van Emden); Cobham (17) in early ix.1950 (*S.L.E.N.H.S.* 1950, 133); Farnborough (16) 20.vii.1984 (Sokoloff); and West Wickham (16) 11.ix.1984 (Birchenough). A pupa from Kenton (21) emerged in x.1940 (de Worms 1954).

Macroglossum stellatarum L. B-I: L-I. 16,17,18,19,21,24. 0:>11:>36.

St Botolphs Churchyard (21) 11.ii.1948 (de Worms 1954); Strawberry Hill, Loughton (18) six in 1947 (Stallwood); Petts Wood (16) numerous in 1944 (Swain); Bookham (17) a few in 1947 (Wheeler); Plumstead Common (16) 15.x.1953 (Rigden); Wimbledon (17) ix.1953 (Craske); Ruislip (21) common in 1955 (Minnion); Ewell (17) 23.vi.1962 (Tunstall); Weybridge (17) a couple in 1964 (Gush); Primrose Hill (21) 27.vi.1976 (Burrows); Tadworth (17) three in a garden in viii and ix.1976 (de Worms 1978); Bromley (16) 14.x.1981 (Sokoloff); Greenstead (19) four in 1982 (Brookes); Grays (18) 23.vi.1982 (Agassiz); Chevening (16) 10.vii.1982 (Hall); Pinner (21) 15.vii.1982 (Minnion); Little Venice (21) 26.vii.1982 (*Ent. Rec.* **94:** 200); Harlow (19) 31.vii. and 18.viii.1982 (McRitchie); Bromley (16) 23.viii.1982 (Sokoloff); Fulmer (24) 13.vi.1983 (Albertini); West Wickham (16) 14.viii.1983 (Jupp) and 18.viii.1983 (Halsey); Hampstead (21) 18.viii-7.x.1983 – six in a garden (Bretherton per Softly); Bookham Common (17) 14.viii.1983 (Bratton); Beckenham (16) 27.viii.1983 (Fox); Potters Bar (21) 9.vii.1984 (Widgery); Croham Hurst (17) 29.vii.1984 (Collins); West Wickham (16) 14.viii.1984 (*A.E.S. Bull.* **43:** 199); Bushey (20) 1 at jasmine flowers on 26.vii.1985 (Goater).

Undated records are: Watford (20), Totteridge (20), Loughton (18), Brixton (17), Kingston (17), Coulsdon (17), and Abbey Wood (16) – all from de Worms (1954).

Daphnis nerii L. B-I; L-I. 16,17,21. 3:7:5.

Tottenham (21) 1884 (*Entom.* **17:** 233); London Bridge (21) 1888 (*Entom.* **22:** 120); Poplar (21) 1888 (*Entom.* **21:** 258); Queen Victoria Street (21) 18.iv.1900 (*Ent. Rec.* **12:** 347); Sydenham (17) 24.ix.1910 (*Entom.* **43:** 318); Chislehurst (16) 14.ix.1926 (*Entom.* **59:** 301); Addiscombe (17) 28.vi.1935 (de Worms 1954); London S.E. 22 [Dulwich] (17) 27.vii.1946 (*Entom.* **79:** 256); Ealing (21) 6.x.1946 (*Entom.* **80:** 35); Wellington Place, N.W.8 (21) vi.1949 (de Worms 1954); Greenford Park Station (21) 30.vi.1950 (*Entom.* **83:** 212); Oxford Street (21) a male on 15.ix.1950 (*Entom.* **84:** 10); Earls Court (21) vii.1953 (*Entom.* **87:** 62); South Kensington (21) late vii.1953 (*Entom.* **87:** 62); Swanley (16) 20.vii.1958 (*Entom.* **79:** 256).

Hyles euphorbiae L. B-I; L-I. 17,18,21. 0:2:4.

Kew Gardens (17) two pupae dug under an oak tree in iii.1907 (*Entom.* **40:** 212); Woldingham (17) a larva on *Veronica agrestis* L. on 23.ix.1939 (*Entom.* **72:** 260); Selsdon (17) a perfect male at m.v.l. on 26.v.1973 (*Ent. Rec.* **85:** 302); Devonshire Square (21) 13.x.1976 (*Lond. Nat.* **57:** 83); Feltham (21) a female on 20.viii.1977 (*A.E.S. Bull.* **37:** 25); Warley (18) 28.vii.1979 (*Ent. Rec.* **92:** 96).

Hyles gallii Rott. B-I; L-I. 16,17,18,21,24. 12:3:13

Silvertown (18) a larva in 1888; Edmonton (21) a larva in vii.1888; Holloway (21) an adult in vii.1888; Buckhurst Hill (18) 2.viii.1888; Victoria Park, Hackney (21) prior to 1898; Chiswick (17) a larva on *Fuschia* on 13.x.1892: (these six all from de Worms 1954); Dartford (16) 4.viii.1888 (*Entom.* **21:** 231); Stamford Hill (21) 1870 (*Entom.* **5:** 169);

Plumstead (16) 1870 (*Entom.* **5:** 265); Tooting (21) 12.viii.1870 (*Entom.* **5:** 82); Weybridge (17) two in viii.1875 (*Entom.* **8:** 271); Warlingham (17) three in 1929 (de Worms 1959); Otford (17) two on 28.vii.1955 (*Entom.* **88:** 210); Dartford (16) 20.viii.1955 (French); Pinden (16) 28.viii.1955 (de Worms 1959); Box Hill (17) vii.1955 (de Worms 1959); Mitcham (17) 1955 (*Croydon Survey:* 145); Bexley (16) 14.viii.1959 (French); Chalfont St Peter (24) 2.ix.1971 (*Ent. Gaz.* **24:** 138); Thorpe (17) 18.vii.1973 (Baker); Selsdon (17) a female on 14.viii.1975 (*Ent. Rec.* **87:** 278); Harmondsworth (21) larva on *Fuschia* 20.ix.1975 (*A.E.S. Bull.* **35:** 124); Brentwood (18) *circa* 1976 (*Ent. Rec.* **88:** 320); Shenfield (18) viii.1976 (*Lond. Nat.* **57:** 87).

Hyles lineata Fabr. ssp. *livornica* Esp. B-I; L-I. 16,17,18,20,21. 11:12:8.

Walthamstow and Upton Park (both 18) 1883 (Buckell & Prout 1899); Cheshunt Street (20) 15.x.1876, and Aldenham (20) 1898 (Foster *Lep. Herts.* 1937); Harefield (21) (Cockerell, *Lep. Middx.* 1891); Waltham Abbey (18) 17.vi.1870 (*Entom.* **5:** 114); Cheam (17) ix.1869 (*Entom.* **4:** 365); Weybridge (17) 1.viii.1868 (*Entom.* **4:** 149); Box Hill (17) vi.1883 (*Entom.* **16:** 234); Kenley (17) 15.x.1898 (*Entom.* **31:** 292); Limpsfield (17) 19.viii.1899 (*Entom.* **32:** 235); Epsom (17) 19.vi.1906 (*Entom.* **39:** 262); Purley (17) 3.viii.1911 (*Entom.* **44:** 365); Sidcup (16) 23.v.1920 (*Entom.* **53:** 190); Merton (17) 15.v.1922 (*Entom.* **55:** 163); Caterham (17) 8.vii.1931 (de Worms 1959); Addington (17) 12.v. 1931 (de Worms 1954); Bexley (16) a female on 8.vi.1943 (C.-H. Kent); Regent's Park (21) 1943 (*J. Soc. Brit. Ent.* **2:** 322); Shenfield (18) 1946 (*Entom.* **80:** 139); Morden (17) 13.xi.1947 at *Nicotiana* (*S.L.E.N.H.S.* **9:** 38); Pinden (16) 3.viii.1949 (de Worms 1954); Sidcup (16) 'recently' [prior to 8.viii.1952] (*S.L.E.N.H.S.*); Arkley (20) 27.iii.1957 (via Bretherton); Sarratt (20) 28.vi.1962 (*Lond. Nat.* **42:** 40); Radlett (20) end of vi.1962 (*Entom.* **97:** 123); Woldingham (17) vi.1964 (*Ent. Gaz.* **15:** 96); Tolworth (17) v.1965 (de Worms 1966); Bermondsey (17) one dead on 2.ix.1967 (via Bretherton); Beckenham (16) one dead in High Street on 18.iv.1985 (Parry).

Hippotion celerio L. B-I; L-I. 16,17,18,19,20,21. 11:2:2.

Blackfriars Bridge (21), Hackney (21) and Ealing (21) in 1885 (Buckell & Prout 1899); Stratford (18) two in 1883 (*Entom.* **16:** 260); Stratford (18) one in 1898 (*Ent. Rec.* **11:** 51); Clapton (21) 5.ix.1895 (*Ent. Rec.* **7:** 87); Oxhey (20) 1893 (*Entom.* **26:** 58); Epping (19) larvae (*Barrett* **ii:** 54); Harefield (21) (Cockerell *Lep. Middx.* 1891); Ewell (17) viii.1898 (*Entom.* **32:** 39); Purley (17) 5.xi.1935 (*Entom.* **69:** 15); West Wickham (16) 1939 (*Entom.* **72:** 120); Wandsworth (17) 14.xi.1955 (*Entom.* **89:** 103); Arkley (20) a male on 3.x.1958 (*Entom.* **92:** 21).

Arctiidae

Lithosia quadra L. B-I,R; L-I. 16,17,18,21,24. 2:>2:13.

New Cross (16) 18.vii.1891 (*Entom.* **24:** 196); King's Cross (21) 20.vii.1891 (*Entom.* **24:** 221); Kingston Hill (17) and Norwood (17) both undated (de Worms 1954); Hampstead (21) viii.1917 (de Worms 1954); Warlingham (17) vii.1929 (Bell); Ruislip (21) 1956 (Minnion); Hook Heath (17) three on 15.vii.1956 (Ansorge); Weybridge (17) 21.vii.1956 (Messenger); Otford (16) vii.1962; Orpington (16) 13.viii.1965 (*Lond. Nat.* **51:** 91); Chalfont (24) a male on late date of 6.x.1965 (*Entom.* **101:** 160); East Hornsby (17) a male on 19.vii.1973 (Wakeley); Coxtie Green (18) vii.1973 (*Essex Guide* p.60); Buckland (17) a male on 28.vi.1982; Broxbourne (20) 31.vii.1985 at m.v.l. (Skinner pers. comm.).

Utetheisa pulchella L. B-I; L-I. 16,17,19,20,21. 5:6:4.

Epping (19) 1846 (*V.C.H.,* 1903); Waltham Cross (20) x.1975 (*Entom.* **25:** 154); Barnet (20) 1892 (*Entom.* **26:** 223); Stamford Hill (21) 31.v.1892 (*Entom.* **25:** 168); Isle of Dogs (21) 3.vi.1892 (*Entom.* **25:** 191); Clapham (17) four in 1901 (*Entom.* **34:** 230 & 297); Regent's Park Zoo (21) 21.x.1921 (*Entom.* **54:** 270); Rickmansworth (20) 15.viii.1949 (Foster, *Herts. List suppt*); Lee (16) 30.viii.1961 (*Entom.* **94:** 285); Meopham (16) 21.ix.1961 (*Ent. Gaz.* **13:** 3); Westerham (16) a female on 1.x.1961 from which were obtained 20 eggs yielding the first adults bred from a 'British' specimen (*Ent. Rec.* **74:** 9); Chadwell Heath (18) 2nd week ix.1978 (Mallet pers. comm.).

Noctuidae

Agrotis ipsilon Hufn. B-I; L-I. 17,18,19,21. Records not properly enumerated.

Widely reported, although of sporadic occurrence, it is likely that many examples are unreported. Records include: Harefield (21) 13.ix.1978 (George); Pinner (21) 1.viii.1979 and 5.ix.1982 (Minnion); and Eascote (21) 31.vii.1982 (Hough); Galleyhill Wood (19) 23.viii.1983 (Plant); Bookham Common (17) 28.ix.1985 (Plant); and at East Ham (18) on 31.vii, and 11.viii.1982, 3.vi, 3.viii and 4.x.1983, and 24.ix.1984 (Plant). Further records, although not dated beyond year, occur in de Worms (1955).

Ochropleura fennica Tausch. B-I; L-I. 21. 0:0:1.

Shepperton (21) a female on 4.viii.1972 – second British record (*Ent. Gaz.* **25:** 51).

Peridroma saucia Hb. B-I; L-I. All. Records not properly enumerated.
Widely reported from all areas in low numbers in most years. Full details are not available for most records.

Xestia c-nigrum L. B-R,I; L-R,I. All. Records not enumerated.

Eurois occulta L. B-R,I; L-I. 16,17,18,19,21. 3:7:12.
Wimbledon Common (17) 1881 (*Entom.* **14:** 258); Epping Forest (18) two on 26.viii.1869 (Meldola – in Hope Dept Coll., Oxford); Larks Wood, Chingford (18) 29.viii.1900 (Buckell & Prout); West Wickham (16) 11.viii.1926 (*Entom.* **59:** 302); Northwood (21) 22.vii.1932 (*Entom.* **79:** 228); Kensington Gardens (21) 8.viii.1937 (*Entom.* **70:** 224); Esher (17) 14.viii.1945, given in de Worms (1955) as 13.viii.1945 (*Entom.* **78:** 174); Beckenham (16) 3.vii.1948 (*Entom.* **82:** 108); Mill Hill (21) 20.viii.1948 (*Entom.* **81:** 248); Wallington (17) 9.vii.1955 (*Ent. Rec.* **67:** 275); Bromley (16) 16.viii.1964 (C.-H. Kent); North Wembley (21) 17.viii.1964 (*Ent. Rec.* **76:** 267); Ongar (19) viii.1964 (*Essex Guide* p.60); Bexley (16) 31.vii.1973 (O'Keefe); Coxtie Green (19) vii.1973 (Wanstall); Norwood (17) 9.ix.1976 (Skinner); Grange Park (21) 1.viii.1982; Perry Green (21) 2.viii.1982; Buckland (17) pale form on 8.viii.1983; South Croydon (17) 31.viii.1983 (the last four via Bretherton); Reigate (17) 1983 (per Bretherton).

Hadena compta Fabr. B-R,?I, L-R. 17,18,20,21. Records not properly enumerated.
West Norwood (17) 10.vi.1962 – first London area record (Skinner, *Croydon Survey:* 367). It is unlikely that any of the London area records relate to primary immigrants. The species is now widespread and locally common in the area.

Mythimna albipuncta D.&S. B-I,?R; L-I. 16,20. 0:0:3.
Pinden (16) 11.ix.1959 (Hare); Totteridge (20) 26.vi.1960 (Lorimer); Lee (16) 8.viii.1969 (Bruce).
The record from Egham (17) on 15.viii.1934 is outside the London area.

M. vitellina Hb. B-I; L-I. 16,17,20,21. 1:1:10.
Finchley (21) 1866 (*Ent. Mon. Mag.* **23:** 110); Westerham (16) x.1931 (*S.L.E.N.H.S.* 1951-52: 27); Arkley (20) 27.x.1953 (*Entom.* **87:** 266); Pinden (16) 1.ix.1961 (Lorimer); Northwood (21) 4.x.1961 (*Entom.* **96:** 36); Bromley (16) 1962 (*S.L.E.N.H.S.* 1962: 42); East Horsley (17) 17.viii.1974 (*Proc. Trans. B.E.N.H.S.* **7:** 95); Nower Wood, Headley (17) 15.x.1977 (Evans); Thorpe (17) 21.x.1977 (Baker); Oxted (17) 1.xi.1982; Reigate (17) a female on 18.x.1984; Buckland (17) 10.xi.1984 (last three via Bretherton).

M. loreyi Dup. B-I; L-I. 17. 0:0:1.
Reigate (17) 29.viii.1983 (*Proc. Trans. B.E.N.H.S.* **17:** 23). This record was actually made at Leigh, which is just outside the area, but is included here since the nearest town, Reigate, which is in our area, was the locality cited in the entomological literature.

M. unipuncta Haw. B-I; L-I. 16,17,20. 0:0:11.
West Norwood (17) 1.viii.1962 (Skinner); Otford (16) 11.ix.1966 (Manley); Lee (16) 4.x.1968 (Bruce); near Thorpe and Virginia Water on the L.N.H.S. boundary line x.1971 (Baker); Broxbourne (20) x.1971 (d'Arcy); Higham (16) 6.x.1975 and 6.x.1976 – a female on each date (*Ent. Rec.* **88:** 282 & 235); Selsdon (17) 14.x.1978 – with 61 *P. meticulosa* and 20 *A. gamma;* Oxted (17) 14.xi.1978, (last two via Bretherton). Wimbledon (17) 1.x.1985 (Dacie); Erith (16) 23.viii.1985 (E. Hare).

Senta flammea Curt. B-R,I; L-I. 16. 1:0:1.
Near Lewisham (16) vii.1828 (Curtis *Br. Ent.*, 201 and also in C.-H. Kent); Pinden (16) 23.v.1964 (*Entom.* **99:** 237).

Calophasia lunula Hufn. B-R,?I; L-?V. 16,17. 0:0:4.
Stone, near Dartford (16) 1952 – one larva, and 1956 – two larvae (C.-H., Kent); Pinden (16) 10.vi.1953 a worn adult at light (*Ent. Rec.* **65:** 323); Bookham (17) 1970 (*Ent. Rec.* **83:** 325).

Lithomoia solidaginis Hb. B-R,I; L-I. 20,21. 0:0:3.
Feltham (21) two males on 28.viii.1954 (Classey); Abbey Wood (20) one at rest on 28.viii.1954 (*Ent. Rec.* **66:** 273).

Lithophane lamda Fabr. B-I; L-I. 16,21. 4:0:0.
'North London' (21) x.1865 – the first British record (South vol. 2); New Cross (16) one on a bole of a tree on 30.ix.1866 (*Ent. Annual* 1867); Darenth Wood (16) 3.x.1870 (*Entom.* **5:** 204); Erith (16) ix.1875 (de Worms 1956).

L. leautieri Boisd. B-R,I; L-R. 16,17,18,20,21. 0:0:records not enumerated.
The first migrants arrived in Britain in the early 1950s and established themselves in the south. The spread of these colonies northwards renders separation of further immigrants impossible in most cases. The first London area record was from Totteridge (20) in xi.1972 (Lorimer) in which year a singleton was also captured at Oxted (17) [Cock, per Marshall, *Croydon Survey]*. This and subsequent records may relate to internal spread rather than immigration. I have no records for the area which can be definitely attributed to primary immigration.

Conistra erythrocephala Fabr. B-I,?R; L-I, extinct R. 16,20. 2:0:0.
St Albans (20) 1866 (*Ent. Annual* 1866: 139); Darenth Wood (16) 28.x.1872 (*Entom.* **6:** 264).

Phlogophora meticulosa L. B-R,I; L-R,I. All. records not enumerated.
Addiscombe (17) a large number on 22.x.1977 associated with *A. gamma* and a single *H. armigera* (Evans); Selsdon (17) sixty-one associated with twenty *A. gamma* and a single *Mythimma unipuncta* on 14.x.1978 (via Bretherton).
These clearly related to immigrant examples; in ordinary circumstances, it is impossible to distinguish such individuals from residents.

Enargia paleacea Esp. B-R,I; L-I. 16,17,18,21. 3:0:2.
Lewisham (16) 1846 (South, vol. 2); Highgate Woods (21) 1870 (*Entom.* **12:** 104 & Cockerell *Lep. Middx.* 1891); Woodford (18) about 1897 (*Barrett* **5:** 309); Reigate (17) 14.viii.1964 (*Ent. Rec.* **77:** 23); Parkway, central London (21) 15.viii.1964 (*Ent. Gaz.* **16:** 114).

Apamea lateritia Hufn. B-I; L-I. 16,17. 0:0:2.
West Norwood (17) 17.vii.1972 (*Proc. Trans. B.E.N.H.S.* **5:** 144); Bexley (16) 18.vii.1972 – at m.v.l., but avoided capture (*Ent. Rec.* **84:** 289).
Second and third British records on consecutive nights. The first was in 1887.

Luperina dumerilii Dup. B-I; L-I. 20. 0:0:1.
Arkley (20) 26.ix.1953 (*Ent. Gaz.* **5:** 116).

Spodoptera exigua Hb. B-I; L-I. 16,17,18,20,21,24. 1:7:>52.
Camberwell (17) 1877 (*Entom.* **10:** 301); Pinner (21) 1906 (Tautz coll. in Hope Dept, Oxford); Hackney Marshes (21) 1940 (*Entom.* **73:** 21); Pinden (16) a female on 9.ix.1945 (*Entom.* **79:** 20); Chipstead (17) 22.ix.1945 (de Worms 1956); Tooting Bec (17) three on 10.x.1947 (de Worms 1956); West Wickham (16) 1950 (de Worms 1956); Weybridge (17) iii.1952 (de Worms 1956); Buckhurst Hill (18) 1952 (de Worms 1956); West Wickham (16) two in 1952 (de Worms 1956); West Wickham (16) 1953 (de Worms 1956); Plumstead (16) 1953 (Showler); London (21) 13.x.1955 (de Worms 1960); Weybridge (17) 12.viii.1955 and 6.ix.1957 (Messenger); Pinden (16) 3.vii.1957 and 22.viii.1958 (de Worms 1956); Ruislip (21) 1958 (Minnion); Kingsbury (21) 1962 (de Worms 1964); Orpington (16) three on 5.vii.1962; Totteridge (20) 6.v.1962; Hampton (21) four from 7-17.v.1962; Whetstone (20) a few in ix.1962 (Ward); Farningham Woods (16) three on 9.ix.1962 (de Worms 1964); Bromley (16) several on 7.v.1962 (*Ent. Rec.* **74:** 162); Chalfont St Peter (24) eight in 1962 with four on 7.v.1962 (Ansorge); West Norwood (17) 13.ix.1962 three at light (Skinner, *Croydon Survey*); 'the London area' (?) several in 1969 (de Worms 1970); North Cheam (17) 21.vii.1971 (*Croydon Survey:* 393); North Cheam (17) 21.vii.1974 (McCormick, *Croydon Survey*); Nutfield, near Redhill (17) viii.1974 (de Worms 1976); Addiscombe (17) 21.ix.1980 (Evans); Grays (18) two on 23.vii.1982 (Agassiz); Rainham (18) 15.vii.1985 (Halsey); South Croydon (17) 25.vii.1985 (Collins).
Undated records from de Worms (1956) are at Pinden (16) and Kingston Hill (17).

Caradrina flavirena Hb. B-I; L-I. 20. 0:0:1.
Totteridge (20) 8.x.1967 – first British record (*Ent. Gaz.* **19:** 90).

Heliothis armigera Hb. B-I,A; L-I; A. 16,17,18,19,20,21. 2:5:12.
Edmonton (21) 1859 (South vol. 2); Epping Forest (?18) prior to 1890 (Buxton 1890); Highgate (21) x.1908 (de Worms 1956); Bexley (16) 21.vi.1922 (*Entom.* **55:** 188); Tooting Bec (17) 10.x.1947 (Christie); Ashtead (17) 24.ix.1948; Caterham (17) 24.ix.1948 (the last two from Bretherton *Pers. Comm.*); Kingsbury (21) 10.viii.1958 (*Ent. Rec.* **70:** 274); Westerham (16) 4.ix.1958 (de Worms 1960); Otford (16) 30.ix.1959 (*S.L.E.N.H.S.* 1959: 41); Totteridge (20) 1.x.1962 (de Worms 1964); Pinden (16) 5.x.1962 (de Worms 1964); West Wickham (16) 24.x.1963 (*Ent. Rec.* **72:** 97); Tattenham Corner (17) 29.ix.1967 (*Croydon Survey:* 393); Totteridge (20) 17.ix.1969 (de Worms 1970); Ongar (19) 14.x.1969 (de Worms 1976); Addiscombe (17) 22.x.1976 [given as 22.x.1977 in de Worms 1978] (*Ent. Rec.* **90:** 55); Purley (17) 13.x.1978 (Bretherton pers. comm.); Rainham (18) at a street lamp on 14.x.1978 (*Ent. Rec.* **91:** 91).

Heliothis peltigera D.&S. B-I; L-I. 16,17,18,20,21. 3:>14:14.
Sydenham (16) 1891 (*Ent. Rec.* **2:** 291); Clapton (21) undated (Buckell & Prout 1898); Lee (16) undated (*V.C.H.* 1908); Pinden (16) 'a few' undated (de Worms 1956); Kenton (21) one bred in viii.1945 suggests the progeny of an earlier immigrant in this area in this 'good' year (*Entom.* **79:** 79); Dartford (16) early v.1945; Mitchett (17) 25.v.1945; Bexley (16) larvae in mid vii.1945 – these may be the source of a series of six in coll. Greenwich Borough Museum [ex coll. L. T. Ford] labelled 'Bexley: bred 45'; (the last four from Bretherton pers. comm.); Putney (17) 12.viii.1945; Wimbledon (17) 18.vii.1945 (*Entom.* **78:** 144); Kenton (21) ova on 9.vii.1945 and larvae reared (*Entom.* **79:** 70); Dulwich (17) a female on 23.vii.1945 (*Entom.* **79:** 256); Purley (17) 12.viii.1945 (*Entom.* **78:** 144);

Dulwich (17) 27.vii.1946 (*Entom.* **79:** 256); Westerham (16) 28.vii.1946 (de Worms 1960); Banstead (17) 26.v.1953 (*S.L.E.N.H.S.* 1953-4: 420; Plumstead (16) 1953 (de Worms 1960); Totteridge (20) 23.iii.1957 (*Entom.* **91:** 107); Weybridge (17) 3.vii.1957 (de Worms 1960); Arkley (20) 10.vi.1958 (de Worms 1960); Westerham (16) 11.vi.1958 (de Worms 1960); Romford (18) 26.v.1966 (de Worms 1976); Orpington (16) 12.vii.1968 (*Ent. Gaz.* **20:** 46); Plumstead (16) 1968 (*Ent. Rec.* **68:** 167); Islington (21) 15.vi.1980; Addington (17) 18.ix.1980; Bushey (20) 19.vii.1982; Buckland (17) 4.viii.1982; Addiscombe (17) 18.ix.1982 (last five from Bretherton pers. comm.).

Eublemma parva Hb. B-I; L-I. 16,17,21. 0:0:4.

Dulwich (17) one on a fence on 17.viii.1953 (*Ent. Rec.* **65:** 216); Otford (16) 21.vii.1959 (*Entom.* **93:** 160); Reigate (17) 10.vii.1968 (*Entom.* **106:** 262); Hanworth (21) 21.vii.1968 (de Worms 1970).

Lithacodia deceptoria Scop. B-I-,R; L-I. 17. 0:0:1.

Reigate (17) 13.vi.1952 (Fairclough). Like the record of *Mythimna loreyi,* this one was made at Leigh, just outside the recording area, and is included here since Reigate is cited as the locality in de Worms (1956).

Deltote bankiana Fabr. B-I,R; L-I. 21. 0:0:1.

North Harrow (21) v.1971 – a worn adult at m.v. light (*Proc. Trans. B.E.N.H.S.* **5:** 117).

Ctenoplusia accentifera Lefeb. B-I; L-I. 16. 0:0:1.

Halstead (16) 10.ix.1969 – new to Britain (*Ent. Rec.* **82:** 149).

Trichoplusia ni Hb. B-I; L-I. 16,17,18,20,21. 1:1:5.

Norbiton (17) v.1896 (South vol. 2); East Sheen (17) 17.ix.1922 (*Entom.* **57:** 68); Ruislip (21) 1958 (Minnion); Westerham (16) 18.vii.1958 (de Worms 1960); Bexley (16) 5.iii.1952 (*Entom.* **86:** 31); Arkley (20) 27.viii.1964 (*Entom.* **99:** 238); Grays (18) 15.ix.1982 (Agassiz).

Diachrysea orichalcea Fabr. B-I; L-I. ?21. 1:0:0.

'J. F. Stephens had a specimen taken in the London district in the mid nineteenth century' (*Barrett* **vi:** 102).

Autographa gamma L. B-I; L-I. All. Records not enumerated.

Usually the commonest immigrant in most years, occurring in every year since at least 1945, and no doubt earlier.

A. bractea D.&S. B-R,I; L-I. 20. 0:0:1.

Totteridge (20) 22.vii.1956 (*Ent. Gaz.* **9:** 20).

Syngrapha interrogationis L. B-R,I; L-I. 17,20,21. 2:1:1.

Ealing (21) prior to 1898 (Buckell and Prout 1898); Reigate (17) prior to 1902 (*V.C.H.* 1902); Cheshunt (20) prior to 1937 (Foster *Lep. Herts.* 1937); Carshalton (17) 13.viii.1955 (Collins, in *Croydon Survey:* 396).

Catocala fraxini L. B-I,R; L-I. 16,17,18,20,21. 11:9:2.

Stamford Hill (21) in Buckell & Prout (1898); Richmond Park (17) 1852 (in Coll. C. N. Hawkins); Regent's Park (21) 9.ix.1870 (*Ent. Mon Mag.* **7:** 111); London Zoo (21) 12.ix.1871 (*Entom.* **5:** 418); Sutton (17) 1875 (*Entom.* **20:** 325); Hyde Park 9.ix.1885 (*Entom.* **18:** 318); Sutton (17) 18.vii.1887 (*Entom.* **20:** 325); Hertford (20) 1887 (*Entom.* **20:** 306); Haileybury (20) 1887 (de Worms 1956); Bromley (16) *circa* 1892 and Farnborough (16) at sugar on 23.viii.1895 (*Ent. Rec.* **7:** 43); Eltham (16) 3.ix.1900 (*Ent. Rec.* **12:** 304); Norwood (17) 10.ix.1901 (*Ent Rec.* **13:** 333); Waltham Cross (20) prior to 1937 (Foster *Lep. Herts.* 1937); Joydens Wood (16) 24.vii.1920 (*Entom.* **53:** 210); Thorndon Park (18) 1920 (*Essex Guide* p.89); Reigate (17) 19.ix.1933 (*Entom.* **66:** 244); Walton (17) 8.viii.1937 (*Entom.* **70:** 249); Wood Green (21) 9.ix.1937 (*Entom.* **70:** 278); Pinner (21) one record (Minnion); Reigate (17) 22.ix.1965 (de Worms 1966); Croydon (17) 23.ix.1983 (*Ent. Rec.* **96:** 16).

Catocala electa Borkh. B-I; L-I. 20,21. 1:1:0.

Hammersmith (21) undated specimens in coll. Henrici at Hope Dept, Oxford (de Worms 1956); Hoddesdon (20) 15.ix.1927 (*Entom.* **61:** 139).

Minucia lunaris D.&S. B-R,I; L-I. 16. 1:0:0.

West Wickham Woods (16) 27.v.1860 (*Ent. Annual* 1861).

Book Review

Hampstead Heath Flora. Habitat Handbook No. 1. Greater London Council. 1986. 60 pp. Not priced. ISBN 7168 1653 9.

This flora, produced by the G.L.C.'s Hampstead Heath Conservation Unit, is the latest in a relatively long line of records of flora of the Heath, which starts with Gerard's *Herbal* of 1597 and Thomas Johnson's *Iter Plantarum* of 1629. It is therefore possible to trace the development of the Heath flora, the most obvious change being the gradual disappearance of the true 'Heath' flora, with species such as *Calluna vulgaris, Erica cinerea* and *Vaccinium myrtillus*. The boggy areas included such plants as *Drosera rotundifolia* and *Menyanthes trifoliata*. Most of these had disappeared by the First World War, though *Vaccinium myrtillus* lingered on until 1967.

The present flora contains a brief note on the geology and topography of the Heath, followed by a note on the flora which mentions the main changes in land use and management, for by now the Heath can hardly be described as a 'natural' habitat. The main part of the flora consists of maps of 261 species; these maps are divided into 100-metre grid squares, 25 of which go to make up larger 500-metre squares. Finally there is an index to 'every species recorded from the Heath since 1632', which gives — in the case of plants now extinct — the date they were last found on the Heath.

It is in principle very valuable to have such detailed records from a fairly small area and in this the G.L.C.'s enterprise is to be commended. However, it does place a high premium on accuracy and completeness and this is where the present work falls down. 'Flora' is interpreted in its narrowest sense; there are no records of trees or shrubs, no grasses, sedges or rushes; no horsetails or ferns (though a few of the latter are listed). This narrow definition limits the handbook's ecological usefulness. The maps are not always easy to read, which is in some cases a result of poor printing. No dates are given as to when the survey work was carried out, though some plants are given as extinct when last recorded in 1981, which seems a rather premature conclusion. No sources are given for the historical information, apart from Johnson and a list made by Tansley in 1931; there is no mention of even a secondary source as Kent (1975) or Burton (1983), where the records from 28T66 give a good indication at the flora of the Heath.

More importantly, there are rather too many errors in the records. This is in some cases the inclusion of fairly obvious garden escapes, not always admitted as such. *Fritillaria meleagris* and *Polygonatum multiflorum* seem most unlikely plants to be found growing naturalised on the Heath. Kent (1975) lists only the latter, with the last record in 1912; Burton (1983) has records for neither in the relevant tetrad. There are also cases of apparent mis-identification, with the rarer species being mistaken for a common one; thus *Chamaemeium nobile (sic)* is mapped, but not *Matricaria recutica (chamomilla)*, which is listed as extinct post-1981 and *Triplosperum inodorum* is omitted completely. Other common plants are omitted, such as *Epilobium adenocaulon*, *Euphorbia peplus* and *Cardamine hirsuta*, all found by the reviewer.

Therefore, while this flora is in principle to be welcomed, its usefulness is diminished by its unreliability; it is a pity more time could not have been spent on its production (including checking the proofs).

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C. M. BALFOUR

Gravel Workings – a Landscape Feature in Epping Forest

by R. L. Layton*

Summary

The landscape of S.E. England is predominantly a result of man's social and economic activity. Part of the geology of the Epping Forest ridge consists of sands and gravels which were exploited for centuries for building material and repairing roads; gravel was also excavated to construct ornamental ponds, sometimes using the unemployed. Many of these former gravel workings add to the present diverse landscape of Epping Forest.

Introduction

That man is an agent of landscape modification is well documented and much publicised. Demands on the landscape for agriculture, urban development, mineral extraction, timber and water resources have seen the emergence of new and radical landscapes. This paper gives a brief outline of how some past management decisions of the conservators of Epping Forest, regarding gravel extraction, have shaped parts of the Epping Forest landscape.

The Resource

Today Epping Forest consists of about 2,430 hectares (6,000 acres) extending in a crescent shape from Forest Gate in Metropolitan London to beyond the town of Epping in Essex. Geologically the area is underlain by London Clay, a blue marine clay of Eocene age laid down in a Middle Tertiary sea. This is overlain, predominantly in the northern part, by Claygate Beds, interstratified clays and fine sands described as passage beds by Dines and Edmunds (1925). This in turn is overlain in parts by Bagshot Beds, light coloured yellowish sand deposited under more estuarine conditions.

As well as the above solid deposits there are a number of Drift deposits. In the north are found deposits of Pebble Gravel – mainly flint pebbles with some angular material and a coarse sandy matrix. This is thought to be fluvial material brought to the area by a north-easterly flowing tributary of proto-Thames. Also in the northern part are outcrops of Boulder Clay. On the lower land to the south are sands and gravels which are of glacial origin, while in the southernmost part are sandy gravels – terrace deposits of the River Thames.

Exploitation of the Gravels

The gravels were exploited from an early date. An account of 1831 describes how 'Gravel and sand pits were open in all directions, and the materials removed without restraint; large spots of ground from which the turf had been removed, rods of ground dug up, and the soil removed for use in gardens both near to and distant from the forest; bushes and underwood cut and removed at pleasure.' (Fisher 1887).

Later in the century, prior to the Epping Forest Act of 1878, the local Highway Surveyors were described as being in the habit of digging indiscriminately all over the forest, leaving holes unfilled and destroying many valuable trees and pasture leaving the surface of the ground in a deplorable appearance. (Court of Common Council 1882). The Epping Forest Act did not preclude gravel digging. Indeed, the committee decided that as large numbers of people and vehicles would run over the roads to the forest it was considered reasonable that parishes should, with certain restrictions, be allowed to take gravel to repair roads within the boundary of the forest. Areas where excavations took place included Lord's Bushes, adjacent to Eagle Road, Long Hills, Wake Arms, High Beach, an area near the Rising Sun, Earls Path, Whitehall Road, Mill Plain, The Lops, an area near Buckhurst Hill Church, Long Running, Blackweir Hill and Crown Hill. In the early years under the Conservators gravel workings were located by the Forest Superintendent and the Surveyors were requested to restore the land each year making a new application the following year – frequently in a different area. This worked reasonably well although certain complaints were made concerning damage to trees, especially in Lord's Bushes. The method of gravel extraction was later changed whereby a specific area for each parish was designated for long-term excavation until the area was exhausted. Here it is interesting to note from an ecological point of view, that there was no obligation to fill in the pit provided it was not dangerous. The view was expressed:

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> 'The opening of the large gravel pits does not necessarily deprive the forest of its beauty; on the contrary, in many cases, when openings have become overgrown with fern and tangle its picturesque character is increased provided they are left rough.' (Court of Common Council 1889).

Not all the gravel extracted was specifically for road repairs. Some was taken out to create ornamental ponds. Thus the swampy area between Whipps Cross Road Leystonstone and the Eagle Road Snaresbrook, old gravel diggings known as the Hollow Pond, was turned into an 8-acre pond. Later certain ponds were created or enlarged as job creation projects for the unemployed. In 1905 Leyton District Council agreed to employ 100 unemployed men for about three months to enlarge Hollow Pond. In 1907, 406 men were employed in excavating and forming a bathing pond to the north of the Hollow Pond and were allowed to sell surplus gravel to recoup part of the cost of the work (Court of Common Council 1907). In 1909 the various Distress Committees set up were employing 500-600 men weekly (Court of Common Council 1909). Permission was also given for the inhabitants of Buckhurst Hill to excavate, at their own expense, a disused gravel pit in Lord's Bushes to provide a bathing place and a swimming pond (Court of Common Council 1899).

Some Ramifications

The practice of digging gravel in the forest probably ended during the Great War although trial holes were dug as late as 1921. The ramifications of these excavations however continued beyond that date. Many of the small gravel workings are now marshy hollows which add scenic diversity to the forest and provide distinct floristic and faunistic habitats. Some of the later larger gravel workings have added a distinct beauty to the forest – Lost Pond on Blackweir Hill is perhaps one of the most beautiful of the Forest ponds. A detailed species list for these ponds is beyond the scope of this paper; it is worth noting however that a number of surveys of old gravel workings have been carried out including work on the Hollow Pond (Ferris 1982), the Cuckoo Pits (Epping Forest Survey 1944) and the gravel pits in Lord's Bushes (Hanson 1983).

There have also been less appealing consequences. Certain of the ponds have been misused. As early as 1884 the conservators reluctantly filled in a number of ponds in the southern part of the forest when, with increasing urbanisation on the forest edge, various people 'made a practice throwing dead animals, stale fish and other offensive substance, into these ponds during the night!' Many ponds still suffer from litter. Some of the shallow hollows have also provided an ideal breeding ground for mosquitoes which has provided a serious nuisance over the years. The problem was particularly severe during the years 1914-16 when a number of ponds were filled in, while others were treated with paraffin to eradicate the problem.

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Book Review

Wildlife in Towns and Cities, Gardens, Parks and Waterways. By Michael Chinery and W. G. Teagle. Country Life Guides. Country Life (Newnes) Books. Feltham, Middlesex. 1985. 224 pp. £5.95. ISBN 0 600 35763 5.

This is an attractive little paperback book covering Britain and Northern Europe, although the fact that Northern Europe is covered is not as clear as it might be. It is of convenient size for carrying in the pocket and is well printed and laid out. The art illustrations are mainly very good although occasionally they are a little too dark. These illustrations are reasonably large and this fact together with the small number per page allows enlargement of some smaller invertebrates, thus showing up more detail. Some of the photographs are good, but many are too small or too dark and have lost detail.

There are ten chapters, each written by a well known authority. Michael Chinery has contributed the introduction, the origins of household insects, and wildlife gardening and conservation. W. G. Teagle surveys the urban wildlife habitats, and has also written the field guide text. Further chapters which give a good idea of urban natural history are, birds in towns and cities (J. D. Summers-Smith), urban mammals (Stephen Harris), introduced plants (John Dony) and greenhouse natural history (Alan Toogood). Industrial melanism: evolution in action (Michael Tweedie) is a clear description and of special interest, while lichens and air pollution (Francis Rose) emphasizes the importance of sulphur dioxide and acid rain. These are all interesting, very readable and written with a refreshing clarity.

The field guide emphasizes, quite correctly, the relatively few selected species commonly found in towns but obviously some less common species have had to be excluded for lack of space. It is very helpful to have included some common exotic plant species which are often omitted from field guides. There is up-to-date, interesting and sometimes even amusing, information on the habits and distribution of birds and mammals in towns, including town birds' nesting habits.

It is a pity that the London Natural History Society is not mentioned in the list of organisations, as indeed it should be. Also in the gazetteer is a descriptive list of wildlife sites within urban boundaries, which will be valuable to many a town-dweller. Then follows a glossary and a useful selected bibliography. The whole book indicates how much may be observed in built-up areas and can certainly be recommended to help beginners search round about their homes with great enthusiasm. They may well be surprised to find still more of interest when they visit the wildlife sites mentioned in the gazetteer.

Geoffrey Beven

Book Review

Checklist of the Flora of the Croydon Survey Area, with Brief Notes and Distribution Maps. J. I. Byatt. Croydon Natural History and Scientific Society, 1985. £3.

The title above is the one on the title-page of this work which was published to present the results of a survey undertaken to celebrate the centenary of the Society. This page, blank on the back, seems to have been added as an afterthought, for it comes between the verso of the front cover, which is numbered Bi and carries the contents list, and Dr Byatt's introduction on page B. The cover itself has the title 'Flora of Croydon, showing plant distribution in the C.N.H.S.S. regional survey area, covering L.Bs of Croydon, Sutton and parts of Bromley...[etc.]'. it also has a line drawing of '*Saxiraga granulata* meadow saxifrage, in parks and grassy places near the centre of Croydon' surrounded by a text which reads 'Did you know that...Bee and other orchids grow in lawns in central Croydon? Don't mow your lawn so often and you might have a surprise! — Many interesting plants still grow on Croydon Airport? — Some of the best populations of early purple orchids grow in Croydon woods?' and so on. The tone of this is in contrast with the note on 'Changes in the flora of Surrey with special reference to the Croydon area, 1920-80, sixty years' on pages Ci and C. This is by 'Mr E. C. Wallace' who can justly claim to have been botanising in Surrey since 1922, and is largely a list of losses and rarefactions.

The main body of the work is the maps on recto pages 1 to 25 and corresponding text on facing verso pages 1A to 25A. The maps show distribution by tetrads (it is nowhere cxplained what a tetrad is) in a rectangle 26×24 km. They have been produced very economically using graph paper and a photo-copying machine. Hand-drawn blobs illustrate the presence of a species in a tetrad and the scientific names of species and families are hand-written in the appropriate places. These names are not repeated in the text, an economy achieved by numbering the species. The text gives English names of all species, and scientific names of those too common, too rare or too transient to be worth mapping. The numbering is based on the map numbers of Flora of Surrey (Lousley 1976), an odd choice requiring a lot of interpolation (56, for instance, is preceded by 54D) and making things slightly awkward for the compiler of the index, which has names of families only. The length and character of the text have also too evidently been designed to limit the costs of publication to a necessary minimum. Most species have only a single line of typescript, which too often gets dangerously close to the inner margin of the page. For adequate information about many of the species it is necessary to turn to the five interim reports of the survey (Byatt 1980, 1981, 1982a, 1982b, 1983).

I would not deny that Dr Byatt and her helpers have done a lot of useful fieldwork and made many worthwhile discoveries. Nevertheless the view must be stated that it is a pity that this survey should have set out to produce tetrad maps so soon after the one which led to the *Flora of the London Area* (Burton 1983). 143 of their 156 tetrads were covered by the L.N.H.S. survey and the remainder had been dealt with only a little earlier either by Lousley (1956) or by Philp (1982). There are very few opportunities to make such comments as the one on *Sisymbrium orientale* 'Our map shows cxtensive colonisation of our area in recent years c.f. map in Fl. London.' Surely it would have been better to celebrate the centenary in some slightly different way, for instance by surveying more intensively a smaller area.

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R. M. Burton

A Quantitative Approach to Oak Variability in Some North London Woodlands

by M. J. Ingrouille* and S. M. Laird*

Summary

The results of a quantative survey of oak tree variation in some north London woodlands are presented. The survey is based on a multivariate analysis of leaf shape. Several methods of analysis are compared. They each suggest that hybrid trees are rare in these woodlands but that *Quercus robur* the pedunculate oak is increasing at the expense of *Q. petraea* the sessile oak. The latter may have been the predominant oak in the southern part of the old Forest of Middlesex, for example in the Hornsey woodlands, in relicts of which it still predominates. The reasons for the absence of *Q. petraea* from Epping Forest are discussed.

Introduction

The pattern of oak variation of the two native oak species, *Quercus robur* L. and *Q. petraea* L. in the British Isles is problematical. There are woods in which trees are very variable where it may be possible to determine the species of individual trees. Other woods are strikingly uniform, consisting only of one species or the other. Both kinds of wood can be found in the London area.

The status of oak woods has been profoundly affected by their history of management. Rackham (1980) describes how it is often possible to distinguish semi-natural oak woodlands from planted populations on the basis of their variability. But the problem is complex and we cannot be sure that the 'uniform' oaks of Epping Forest which is an ancient wood-pasture, have suffered more management than the variable oaks of Ken Wood, another ancient woodland. Other factors are involved, not least the extent of hybridisation in different areas between the two native species.

Introgressive hybridisation has often been cited to explain the extent of variability in the oaks of the London area, as in the *Flora of the London Area* (Burton, 1983). In London *Q. robur* is recorded much more frequently than *Q. petraea* which is said to show the effects of introgression more frequently.

Many analyses of oak variation have been attempted. Some of these are hindered in the kinds of conclusions that can be reached because of the kind of analysis. Many are hampered by the small number of characters studied and most are hampered by *a priori* reasoning about the spectrum of variation. Multivariate methods of analysis have the advantage that they attempt in a very objective way to describe the pattern of variation and measure individual variation rather than character variation. The disadvantage of these methods is of course that they are very costly in the time it takes to collect the necessary data.

Each different analysis potentially produces different results. Only by a comparison of the results can overall conclusions be reached. In the study reported here the results from analysis of a small number of oak woodlands in north London are reported and several different methods of analysis are compared.

Materials and Methods

Samples of fallen leaves were collected from beneath individual trees in the autumns of 1983 and 1984. Such samples were assigned to distinct individuals even though mixing of leaves from different trees may have occurred. Such mixing would reduce the distinctness of individuals increasing measured individual variability, i.e. increasing noise and making the detection of underlying trends more difficult to detect. Errors of this kind are not likely to lead to the

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identification of a non-existant pattern but rather to obscure an existing pattern. Type 2 errors of this sort can be tolerated. It will be shown that the most important source of variation in woods is that between trees rather than between leaves within individual trees in spite of possible mixing of leaves. The alternative method of collecting leaves by taking cuttings suffers from the risk of only sampling shade leaves or lammas leaves. Wigston (1975) found that leaf litter leaves reliably reflected the properties of fresh material. As has previously been the practice (Wigston 1975, Jones 1959) very small leaves have been eliminated in this survey because of their variability. Leaves were stored at −4°C until being scored.

In the autumn of 1984 it proved possible to sample acorns from some trees. Sampling was concentrated on woods in north London (Table 1).

TABLE 1. Sampled sites.

Sampled sites	Grid Ref.	Number of sampled trees
Hampstead		
Ken Wood	TQ 273 871	24
Sandy Heath	TQ 264 868	10
Boundary	TQ 276 874	9
Highgate	TQ 284 885	20
Queen's Wood	TQ 287 885	10
Hampstead, Bigwood	TQ 255 888	10
Hampstead, Littlewood	TQ 253 890	10
Coldfall Wood	TQ 276 903	10
Alexandra Park	TQ 297 903	10
N. Circular, Finchley	TQ 269 912	10
Coppet's Wood	TQ 276 916	10
Grovelands Park	TQ 309 943	10
Monken Hadley Common	TQ 270 970	10
Trent Park, Williams Wood	TQ 282 972	10
Epping Forest	TQ 413 964	10

Characters used to distinguish *Quercus robur* from *Q. petraea* have been well documented (Cousens 1962, 1963, 1965, Carlisle and Brown 1965, Wigston 1975 and Rushton 1976). Wigston (1975) recommended that characters used to assess status should have a narrow range of expression and be easily recognised. In this study as many characters as proved possible and reasonable to score were scored (Table 2 and Figure 1). These include some of the indices used by previous workers.

TABLE 2. Characters scored for multivariate analysis.

Leaf characters

1. Lamina regularity (Rushton 1978)
2. Lamina base shape
3. Auricle type
4. Number of lobe pairs (Wigston 1975)
5. Lobe regularity (Wigston 1975)
6. Petiole length
7. Lamina length
8. Lamina widest point
9. Lobe width
10. Lobe depth
11. Sinus width
12. Tip length
13. Tip width
14. Auricle size
15. Lobe length 1
16. Lobe length 2

17. Shape index (Wigston 1975)
18. Lobe depth ratio (Cousens 1962)
19. Lamina ratio (Char. 7/Lamina width)
20. Lamina shape (Char. 7/Char. 8)
21. Tip shape (Char. 12/Char. 13)
22. Lobe shape 1 (Char. 15/Char. 16)
23. Lobe shape 2 (Char. 15/Char. 10)
24. Sinus ratio (Char. 18/Char. 11)
25. Lamina/petiole ratio (Char. 7/Char. 6)
26. Petiole/auricle ratio (Char. 6/Char. 14)

Acorn character

27. Peduncle length

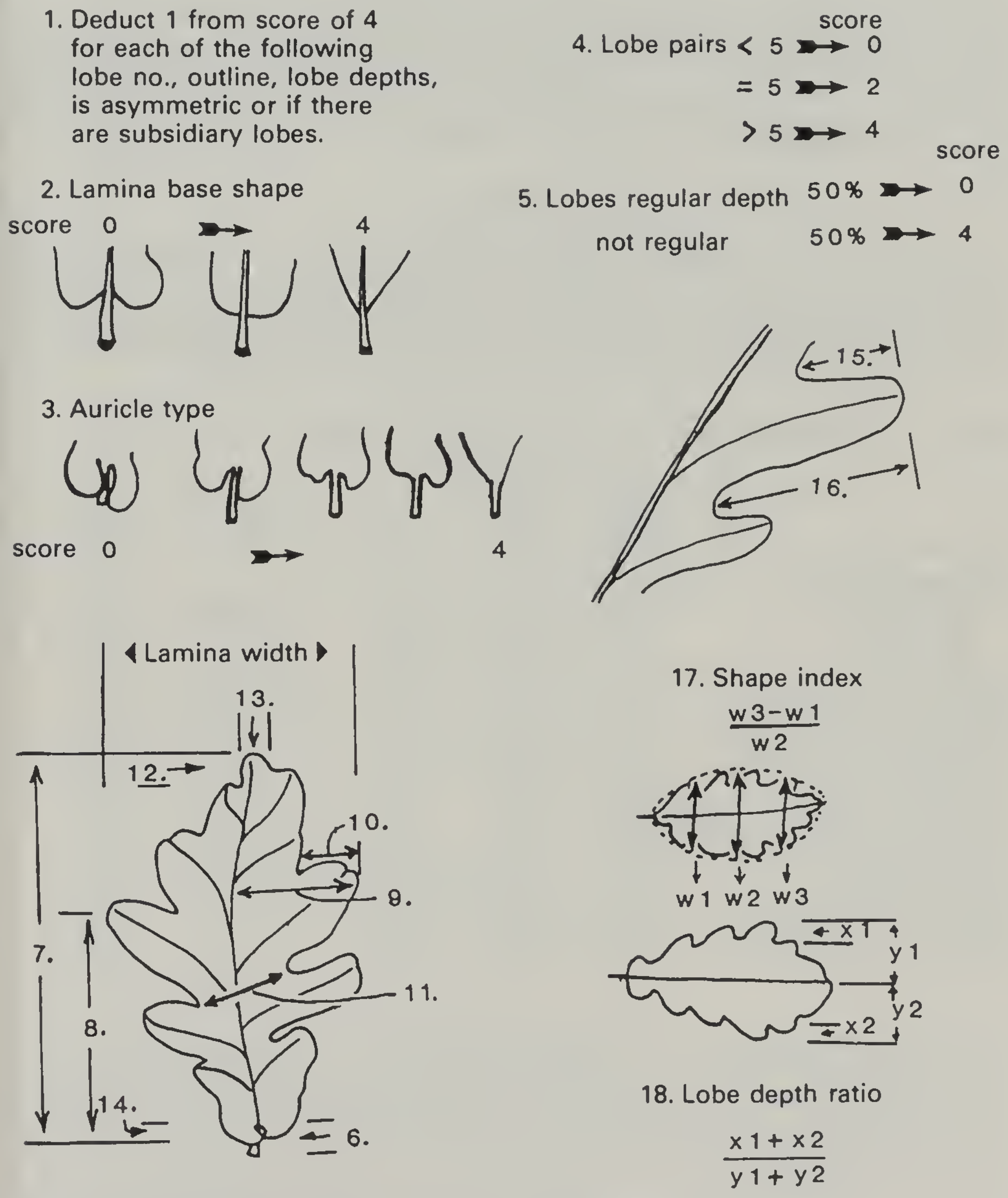

FIG. 1. Leaf characters. Characters numbered as in Table 2.

Method of Analysis

Individual tree means were obtained from either 10 (in 1983) or 6 leaves (in 1984).

1. A hierarchical analysis of variance was carried out.

2. Characters 1-6 were used to construct a hybrid index. On the basis of these characters a typical representative of *Q. robur* would score 0 for each character and a representative of *Q. petraea* scores 4. Intermediate score 1, 2 or 3. Scores for each character were summed for each leaf. Frequency histograms were plotted for each site. Mean indices for each tree were calculated.

3. A principal components analysis was carried out on the leaf data, characters 6-26.

4. Scatter diagrams of some characters were plotted.

5. A cluster analysis was carried out on the same data using squared euclidean distance and minimum variance spherical clustering (Ward's method) as the clustering parameters. Initial data manipulation was carried out on the Birkbeck College Vax VMS computer with later statistical analysis on the University of London Amdahl computer using the computer packages SPSSX (SPSS INC. 1983) and CLUSTAN (Wishart 1978).

Results

1. The hierarchical analysis of variance is summarised in Table 3. In only one wood (Little Wood, Hampstead) is the F ratio (between/within trees variance) not significant at the 95% level. This may be due either to poor sampling so that leaves from different trees were mixed or because the trees were very similar. That it may be the latter is indicated by its low coefficient of variation.

TABLE 3. Hierarchical analysis of variance of petiole length

	Mean square				
Sampled Site	Leaves within trees	Trees within woods	F ratio	Coef. of var.	Mean (mm)
Hampstead Heath					
Ken Wood	7.41	200.23	27.0	0.43	14.3
Sandy Heath	4.91	188.0	38.3	0.49	11.9
Boundary	3.38	217.0	64.1	0.85	7.3
Highgate	6.66	159.7	24.0	0.50	11.1
Queen's Wood	7.30	24.28	3.3	0.45	7.4
Hampstead, Bigwood	2.37	15.10	6.4	0.34	6.2
Hampstead, Littlewood	2.67	3.19	1.2	0.32	5.6
Coldfall Wood	15.07	135.12	8.9	0.38	15.9
Alexandra Park	10.31	123.99	12.0	0.54	10.0
N. Circular, Finchley	1.40	18.10	12.9	0.33	6.2
Coppet's Wood	5.00	15.89	3.2	0.44	6.2
Grovelands Park	15.73	41.21	2.6	0.26	18.13
Monken Hadley Common	1.35	32.11	23.8	0.38	6.60
Trent Park, Williams Wood	5.26	52.20	9.9	0.50	7.22
Epping Forest	1.23	32.55	26.3	0.37	6.65

2. Frequency histograms of the hybrid index scores of individual leaves are illustrated in Figure 2. Because of the small sample of trees from each locality it is not useful to plot frequency histograms for trees from each locality but an overall comparison of leaf hybrid indices and mean tree hybrid indices for all sampled sites is illustrated in Figure 3. On the basis of leaf hybrid indices there is a high degree of intermediacy in the Highgate Wood. Tree averages show that most trees can be unequivocally assigned to either *Q. petraea* or *Q. robur*. On Hampstead Heath, Ken Wood is mainly *Q. petraea* with a few *Q. robur* trees, Sandy Heath is a more equal mixture of the two species and trees from the wood at the edge of the heath are mainly *Q. robur*.

The hybrid index is highly negatively correlated with peduncle length (r = 0.694 significant at greater than 99% probability).

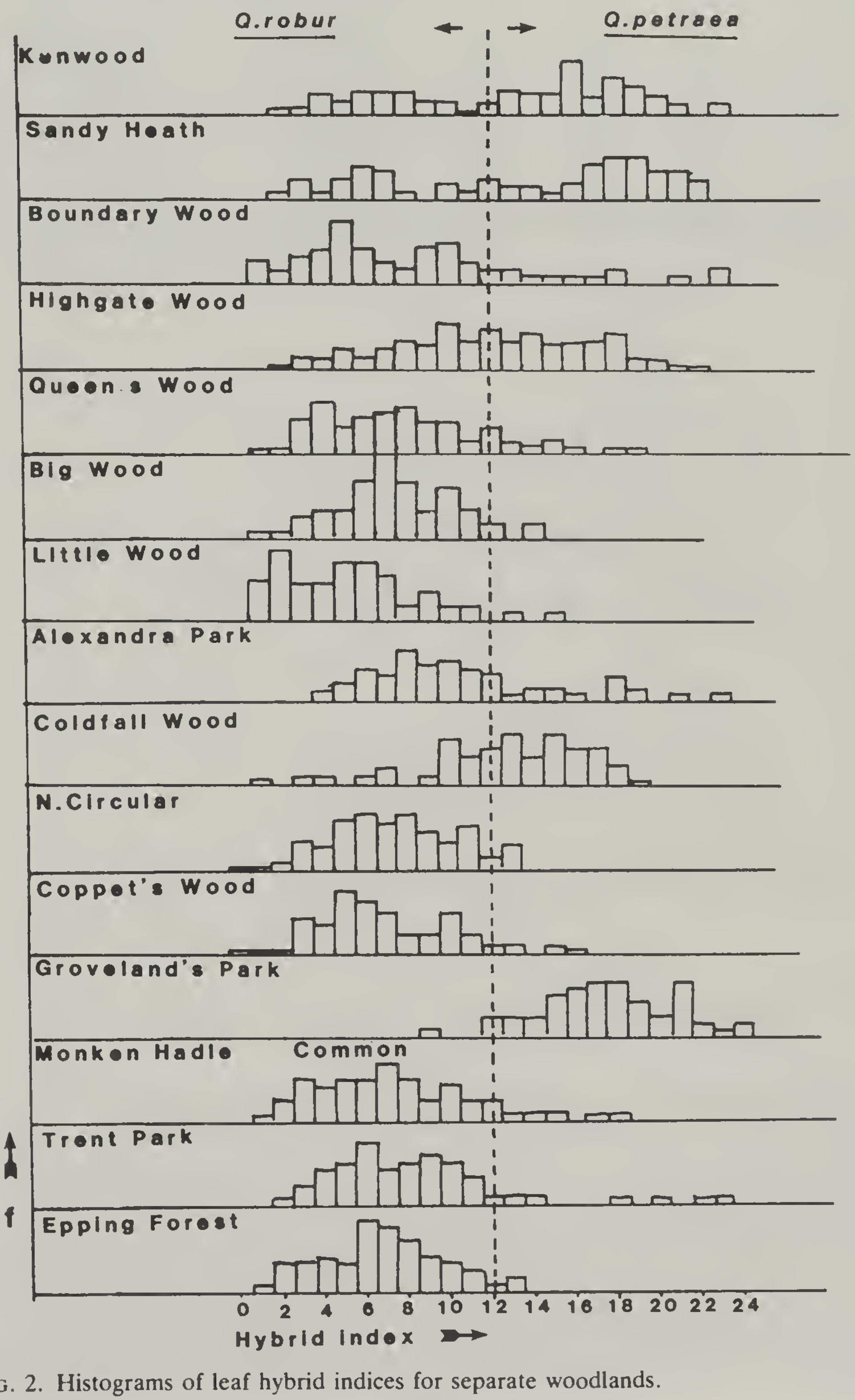

FIG. 2. Histograms of leaf hybrid indices for separate woodlands.

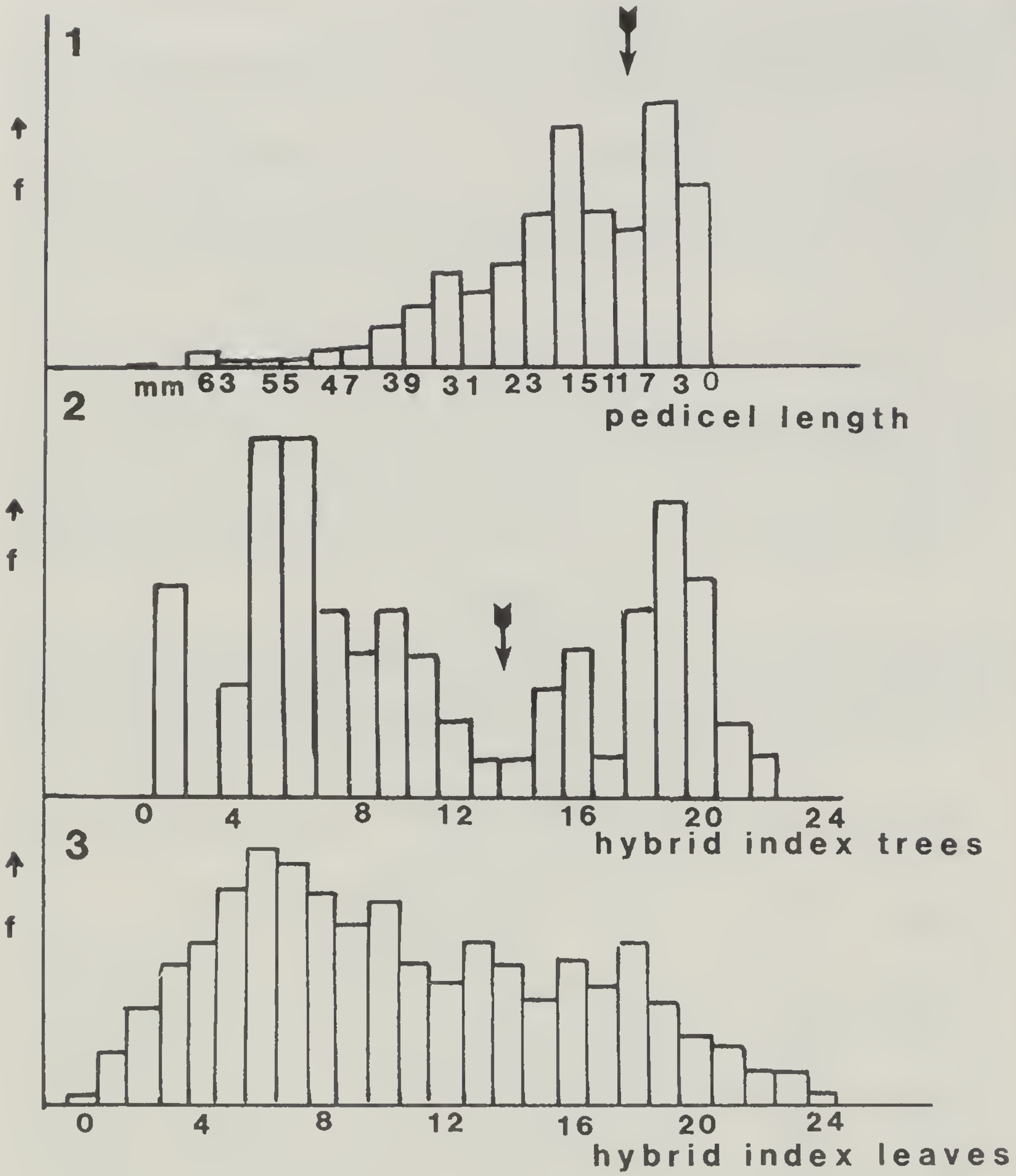

FIG. 3. Histograms of hybrid indices of leaves and of tree means, and pedicel length. Arrows indicate probable boundary between *Q. petraea* and *Q. robur*.

3. Principal components analysis is very successful in simplifying the data/OTU matrix. The first five components account in order for 35.2%, 18.5%, 9.5%, 9.2%, and 5.3% of the total variance. The first two components account for over half of the variance together (53.7%). The factor loadings which identify the most important characters for each component are listed in Table 4.

None of the components clearly distinguishes separate variants, but like the hybrid index they identify in some cases a *Q. petraea* – *Q. robur* axis with two modes (Figure 4). The correlations between the first five components and with the hybrid index and the peduncle length are listed in Table 5. Component 1 and component 5 are most highly correlated with the hybrid index and validate the use of this index. The correlation with peduncle length supports the use of this single character if available to identify the different species.

TABLE 4. Eigenvectors (factor loadings) of the first five principal components, only the most important characters included.

Character	Principal component 1	 2	 3	 4	 5
1. Lamina length	−0.033	0.465	−0.078	0.223	−0.015
6. Petiole length	−0.286	0.210	−0.143	−0.037	0.295
8. Widest point	−0.046	0.422	0.030	0.360	−0.018
9. Lobe width	−0.023	0.469	−0.191	−0.119	−0.155
13. Tip width	0.110	0.209	0.518	−0.237	−0.115
17. Shape index	0.033	−0.078	0.024	0.432	−0.308
18. Lobe depth ratio	0.341	−0.071	−0.129	0.052	0.061
20. Lamina shape	0.004	−0.072	0.236	0.514	0.248
22. Lobe shape	0.292	0.053	−0.272	−0.065	0.296
25. Lamina/petiole ratio	0.330	−0.139	−0.052	0.153	0.103
Percentage variance	35.19	18.49	9.53	9.20	5.25

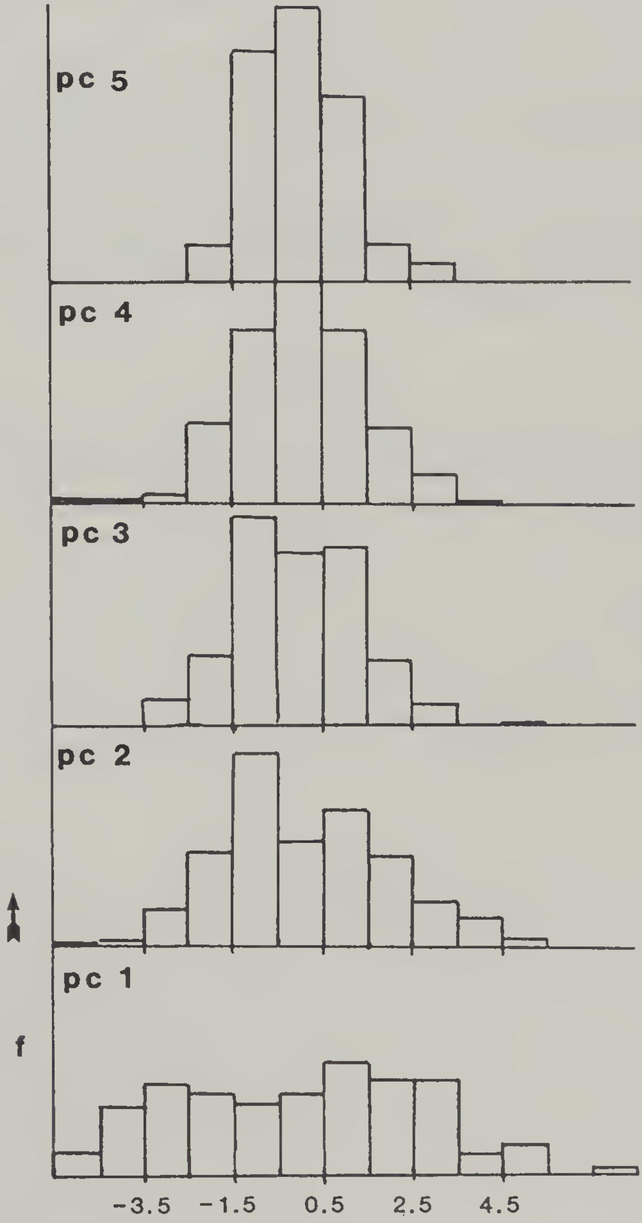

FIG. 4. Histograms of the first 5 principal components.

TABLE 5. Correlations between components, hybrid index and peduncle length.

Principle component	1	2	3	4	5	Hybrid index
Hybrid index	−0.853	0.351	−0.114	−0.010	0.500	
Peduncle length	0.676	−0.102	0.602	−0.006	−0.468	−0.694

Component 2 is a good measure of variation in leaf size. Component 3 abstracts variation in lobe and especially leaf tip shape and component 4 abstracts a different kind of shape variation measured especially by Wigston's shape index depending on where the widest point of the leaf is.

4. Scatter diagrams of principal component 1, hybrid index and peduncle length successfully identify a *Q. petraea* and a *Q. robur* group (Figure 5). There is considerable variation in each group. The complexity of the pattern of variation is illustrated by the scatter plot of component 1 against component 5. Both of these components are highly correlated to the hybrid index and to peduncle length but together they fail to resolve the two species.

The hybrid index and the principal components analysis share only one character, petiole length. Though both identify a *Q. petraea* – *Q. robur* axis the relative order of individual scores on each axis is different as is shown by the broad scatter of points when they are the two axes in a scatter plot.

5. Cluster analysis clearly identifies two clusters representing *Q. petraea* and *Q. robur* (Figure 6). On this evidence the sampled woods are of three kinds; pure *Q. petraea* – Grovelands Park and Coldfall Wood, mixed *Q. petraea*/*Q. robur* – Highgate Wood, and Hampstead Sandy Heath and Ken Wood and the remainder pure or nearly pure *Q. robur*.

Discussion

The correlation between the entirely objective multivariate methods of analysis (cluster analysis and principal components analysis) and the other measures used to identify the British oak species supports the use of the latter quicker methods. But the results from the multivariate techniques emphasise the complexity of the pattern of oak leaf variation. There are patterns of variation which do not relate in a simple way to the *Q, petraea*/*Q. robur* dichotomy.

The use of leaf data to detect hybridisation between the two species must be questioned. Some previous studies are confounded by the use of few characters (Cousens 1963, Cousens 1965) and the analysis of leaves rather than trees (Wigston 1975). On the basis of any one or few characters trees may appear intermediate but overall they may more truly represent outliers of the normal pattern of variation of a single species. Any attempt to determine intermediacy on the basis of individual leaves rather than tree averages is likely to lead to spurious results.

Both Carlisle and Brown (1965) and Rushton (1978, 1979) using multivariate methods on tree averages have detected intermediate trees which have been equated with hybrids. Carlisle and Brown (1965) are careful to emphasise that hybrid index methods over-estimate intermediacy. Only extremely 'typical' representatives of each species get very high or low scores. Rushton (1978) identifies intermediates by principal components analysis. Notably he demonstrates that a majority of intermediate trees have a lower pollen viability than more typical trees. This is very good evidence of hybrid status. But he found intermediate trees with high pollen viability which may represent introgressed variants. It is important to note that hybridisation may occur at a very low rate. The level of inter-fertility between the species has been recorded as being 2% (Dengler 1941). But the results of a hybridisation event may be very long-lived. There is a strong possibility of backcrossing and introgression so that the influence of a hybridisation event may be discerned hundreds of years after it has occurred though only a few oak generations.

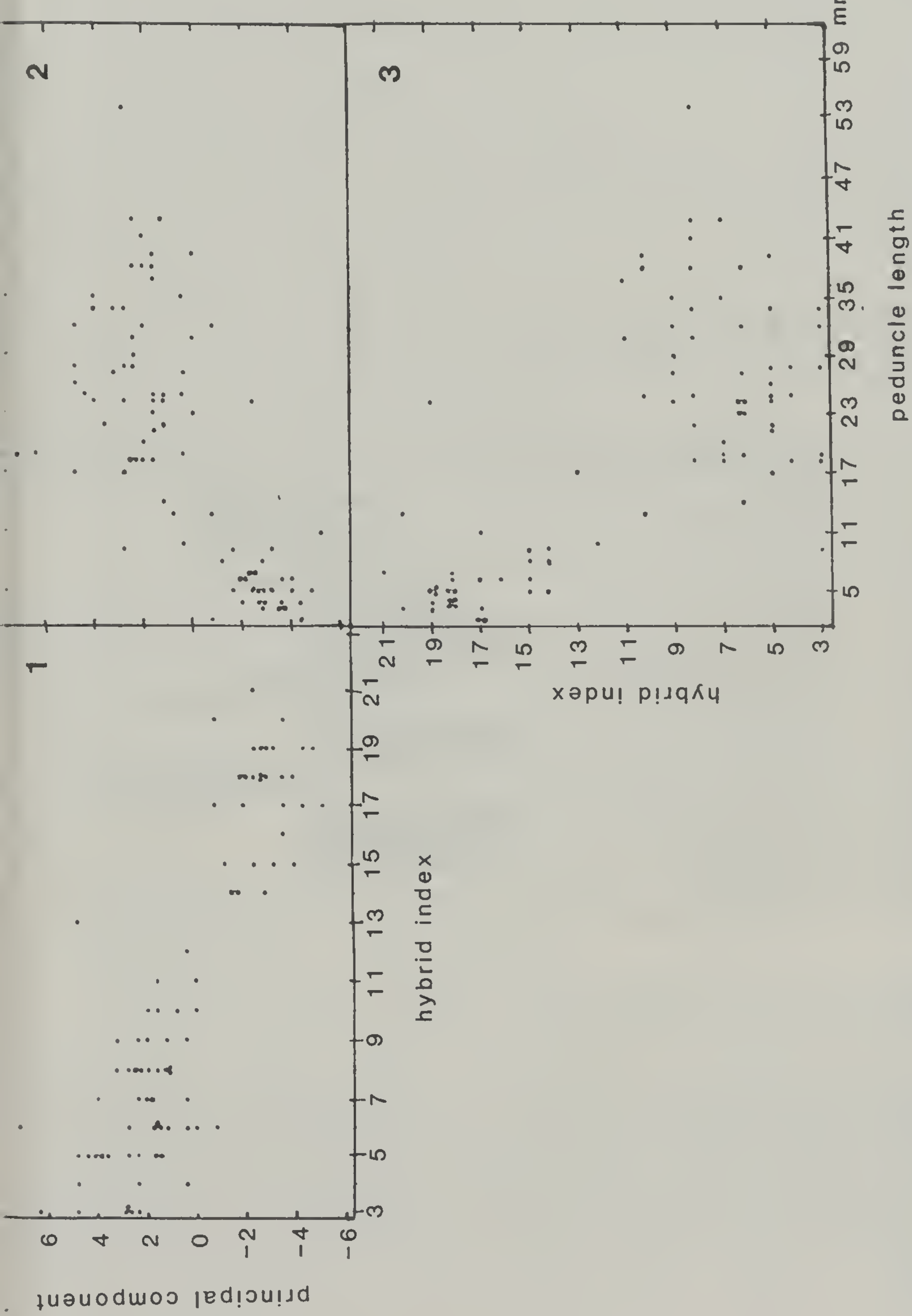

Fig. 5. Scatter diagrams. 1. Principal component 1 with hybrid index; 2. Principal component 1 with pedicel length; 3. hybrid index with pedicel length.

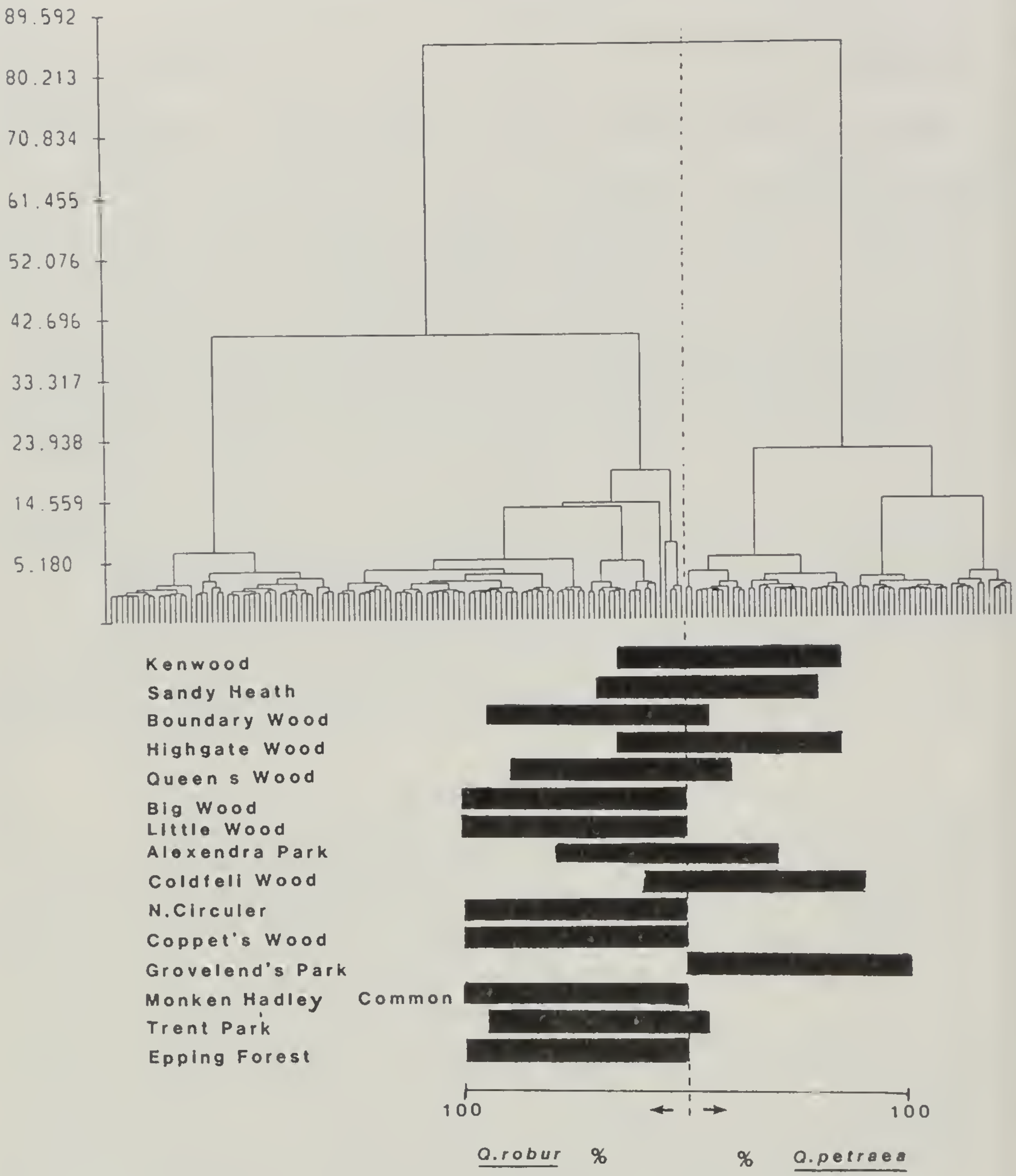

FIG. 6. Phenogram of oak trees. Cluster 1 = *Q. robur;* Cluster 2 = *Q. petraea.*

Without evidence of pollen viability the data presented here are not inconsistent with the presence in north London of two variable species with few hybrids. The frequency histogram of hybrid index scores is obviously bimodal with very few intermediate trees. The frequency histogram of the first principal component score for trees is also bimodal but with a broad overlap. On the basis of the hybrid indices for leaves Highgate is the population with the most intermediate leaves, but from the first principal component scores few trees are intermediate. Only four from twenty trees are in the region of overlap with scores between – 1.5 and 0.5.

It is likely that in north London that there are few hybrids but introgression in perhaps the distant past has made some populations more variable. Any analysis of London woodlands is of course made difficult the fact that the woodlands must have been severely modified by man if not intensively managed. The few *Q.*

petraea individuals in woods on Monken Hadley Common and Trent Park may have been introduced. The exotic *Q. cerris* L. has also been planted in Trent Park. But the presence of *Q. petraea* on Hampstead Heath and in Highgate, Grovelands Park and Coldfall woods cannot be explained away as plantation just because for example the exotic *Q. borealis* Michaux f. is present in Highgate wood.

Q. petraea is much rarer in London than *Q. robur* but is found in a band on the Blackheath Beds in south London. In north London the *Q. petraea* is on the Bagshot Sands and associated Claygate Beds (sand and loam) in Hampstead but scarcely on the Claygate Beds in Highgate though there is an outcrop of Bagshot Sands ¼ mile to the south. In Grovelands Park it grows on glacial gravel which also bound Coldfall Wood on one side. The separate *Q. petraea* woodlands may represent the relics of a more extensive *Q. petraea* woodland based on the Bagshot Sands on Hampstead Heath. But these sands also outcrop in Epping Forest where there is no *Q. petraea.*

We are lucky in having pollen analyses for sites in both Epping Forest (Baker, Moxey and Oxford 1978) and Hampstead Heath (Girling and Greig 1978) for a time before man's activities greatly modified the wildwood. They show a good correspondence and in common with many other analyses indicate that the wildwood in these areas was *Tilia* dominated.

The uncorrected pollen frequencies are 65% and 30% for Epping and Hampstead respectively. This must have meant that the Epping woodland was almost pure *Tilia* (corrected value is 96%) with a small quantity of *Quercus*. At Hampstead *Tilia* was approximately 66% with about 20-25% *Quercus* and a little *Ulmus*. Strict comparisons cannot be made because they rely on the size of the pollen collecting basin, but the wild wood at Hampstead was much more mixed.

Unfortunately the pollen analyses cannot separate the *Quercus* species. However there is a major difference between the Hampstead and Epping pollen stratigraphies which may give a clue to the present distribution of the two species in north London. At Hampstead the *Tilia* decline follows shortly after the elm decline which occurred 5,000 years B.P. In contrast the *Tilia* decline in Epping is very late not occurring until the Saxon period, no more than 1,400 years ago *Quercus petraea* is now associated with poorer, acidic, well-drained, sandy or gravelly hill-top soils (Rackham 1980), hence its abundance on the Bagshot Sands in a band south of London. Of course these were often the areas first cleared by man, though not at Epping. One can imagine that initially in the wild wood *Q. petraea* was the oak present but due to some unknown factor *Q. robur* gradually became prevalent from 5,000 years ago. In this situation the timing of the initial clearance of the wild wood would be critical in determining whether a *Q. petraea* or a *Q. robur* woodland became established.

The present behaviour of the two species on Hampstead Heath provides another clue. Here the mature oak woodland, Ken Wood, is largely *Q. petraea*, but surrounding it and in some areas colonising the heath (as on Sandy Heath and in the Boundary wood), the oak is *Q. robur*. Rackham (1980) describes *Q. petraea* as being much more frequently the oak of ancient woodlands while *Q. robur* is the oak of secondary woodlands and is a common pioneering species. *Q. petraea* is usually found forming an oak wood. In comparison *Q. robur* is now often found as a small component of many other kinds of woods. It is possible that in the mixed wild wood of north London *Q. petraea* was the only oak species. On the clearance of *Tilia* by man, which is indicated by the presence of charcoal and occurred in a number of stages, *Q. petraea* became the dominant species. In Epping the smaller quantity of oak present in the wild wood may have been as solitary *Q. robur* trees scattered through the *Tilia* woodland. The later clearance of *Tilia* from Epping gave rise to a *Q. robur* woodland because no *Q. petraea* was present. This has to remain a speculation. It may be that to understand the present distribution of the two oak species we have to understand the different behaviour of the oaks in the kind of *Tilia* woodland which no longer exists today.

The aggressive colonisation of Hampstead Heath by *Q. robur* today may mirror the pattern of colonisation of cleared and otherwise man-modified woodlands in the past which gave rise to such woods as Coppets Wood. On land near Coppets Wood beside the North Circular Road a young pioneer woodland of *Q. robur* can be observed. *Q, petraea* may be seen as a decreasing relict in north London. Queen's Wood is predominantly *Q. robur* but must have been initially a *Q. petraea* woodland. Over the road *Q. petraea* is confined to the southern part of Highgate Wood. Over the past several thousand years man's activities have favoured *Q. robur* in a haphazard way. In lowland England only where clearance of the *Tilia* woodland was early enough and on poorer well-drained soils did *Q. petraea* woodlands become established.

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The Flora of Totteridge and its Neighbourhood

by DIANA GRIFFITH*

Summary

A survey of the flora of Totteridge and its environs was made between 1980 and 1985. Despite increasing urbanisation, 378 species of vascular plants were found. Some of these are now comparatively uncommon in the more open countryside where intensive farming predominates.

To avoid long lists of species, these have been confined to the Appendix and only less common plants mentioned in the text – sometimes uncommon locally only – except to illustrate ecological points.

Introduction

Totteridge lies approximately nine miles north of Marble Arch and one mile south of Barnet; until 1965 it was the most southerly part of Hertfordshire. It is now part of the London Borough of Barnet and has a London postal number, N.20. It is just over a mile north of Mill Hill (previously Middlesex, now N.W.7), the old Herts./Middlesex boundary running along the Folly Brook (Fig. 1).

Totteridge is to the west of the Great North Road up which the cattle and other livestock travelled on their way from the Midlands and Wales to Smithfield Market. The last staging post before Smithfield was at Chipping Barnet where the great mediaeval horse fair took place every September. Barnet Fair is still held in the fields of Dollis Valley west of the Great North Road and in the parish of Totteridge.

The area of the present survey covers approximately 1,000 hectares (about 3.8 square miles) and extends from Mays Lane, Barnet in the north to Mill Hill Ridgeway, Partingdale Lane and Lullington Garth in the south, and from Hendon Wood Lane and Highwood Hill in the west to Whetstone High Road (Great North Road) in the east. The survey thus includes the whole of the parish of Totteridge and adjacent parts of Barnet, Arkley, Mill Hill, Finchley, Woodside Park and Whetstone. About 300 hectares of the area are densely built up, leaving 700 hectares for study.

The approximate centre of the area is Ordnance Survey map reference TQ 240937. The area lies mainly in tetrads 29T24, 29T44, 29T22 and 29T42.

Although a Green Belt suburb, Totteridge clings to its rural roots and residents prefer to regard it as a knuckle of farm land projecting into the great city. Indeed, Ellern Mede, Totteridge and Burtonhole, Mill Hill are probably the nearest working farms to central London.

Physical Features

1. Geology and Soil

The original village of Totteridge stands on the ridge which separates Dollis Valley, in which runs the Dollis Brook, from Totteridge Valley, in which runs the Folly Brook (Fig. 2). These streams meet at Woodside Park and ultimately drain into the River Brent.

The highest point of the ridge, at the top of Damson Hill, is 126 metres (approximately 410 ft) above sea level. The central 120 metres (400 ft) contour approximates to a small area of thin pebble gravel around the Long Pond and its three neighbours Ellern Mede Pond, Warren Pond and Burnham's Pond.

The pebble gravel caps a larger area of Claygate Beds (sandy clay) which

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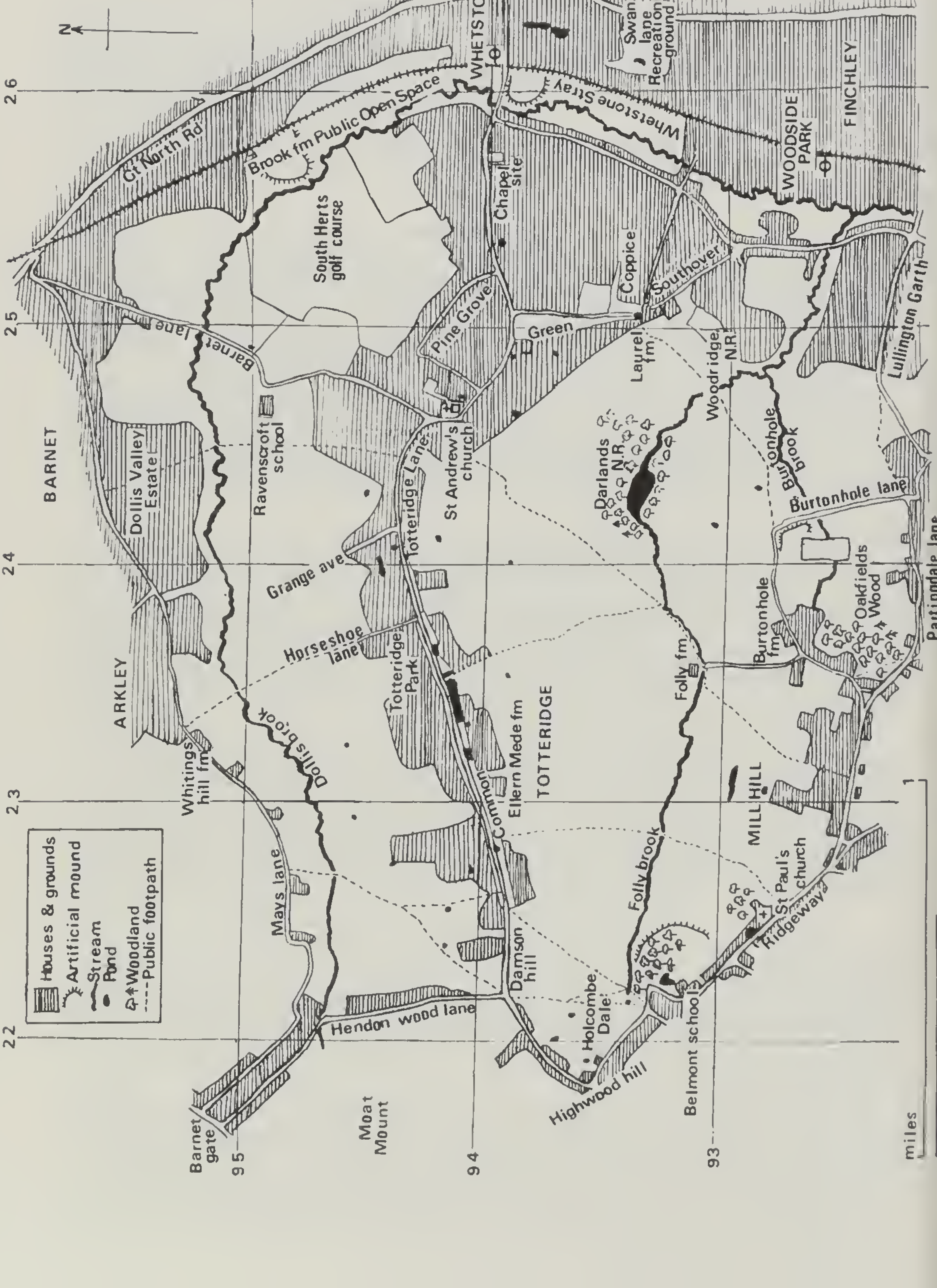

FIG. 1. Sketch map of Totteridge and distri

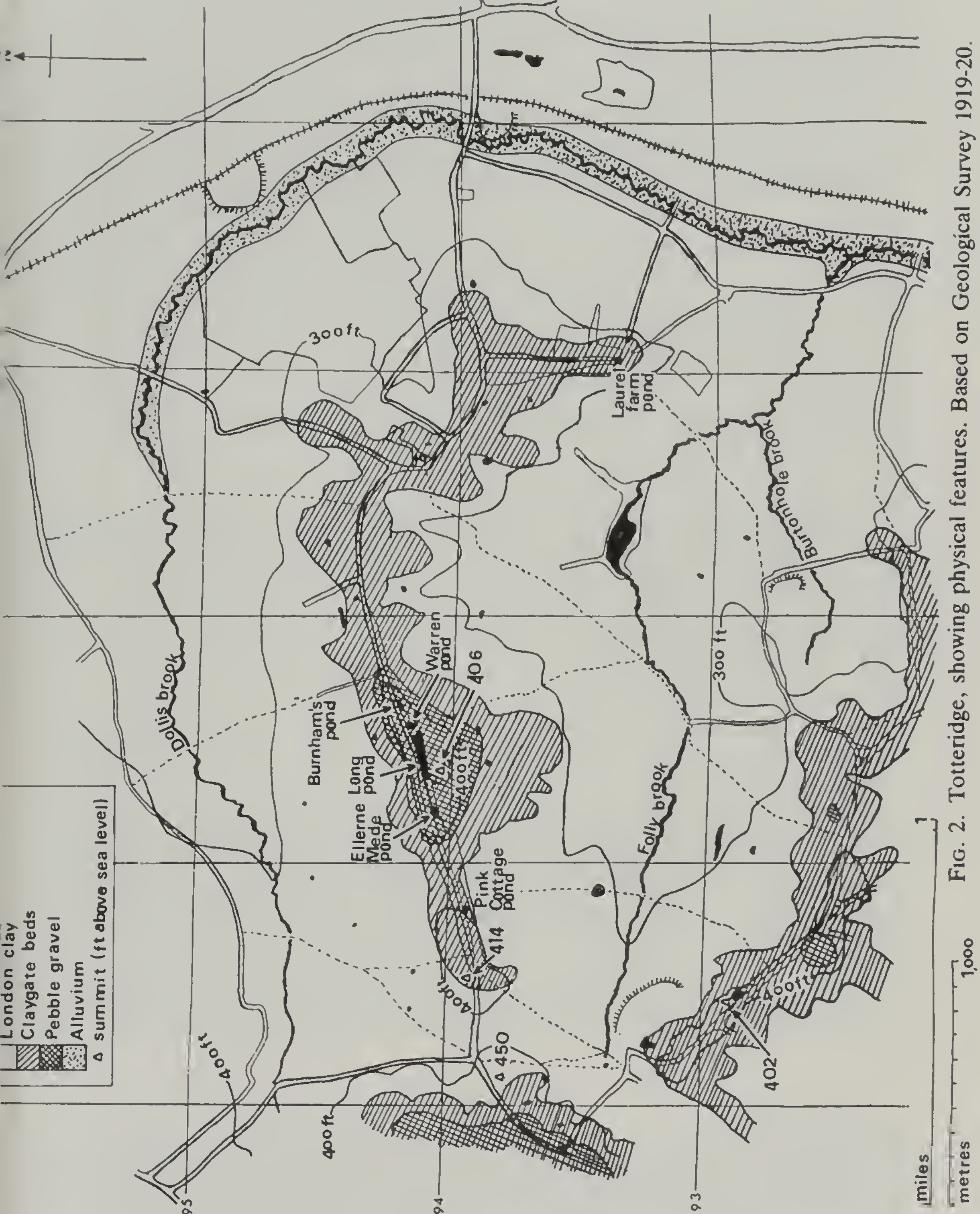

FIG. 2. Totteridge, showing physical features. Based on Geological Survey 1919-20.

extends towards the 90-metre (300 ft) contour. Mill Hill Ridgeway and the adjacent area also lie on Claygate Beds, with two small patches of pebble gravel. All the rest of the area below and around these ridges is London Clay apart from a band of alluvium along the Dollis Brook and a tiny deposit of pebble on Pink Cottage path (public footpath No. 23). The survey area is thus mainly the southernmost part of the Eocene plateau of south Hertfordshire. The regolith (subsoil) over this foundation geology is heavy textured and imperfectly drained.

The water table is high – the many small ponds and little streams which are a special feature of pebble drift ridges associated with Eocene clay (in our case London Clay and Claygate Beds) are well illustrated by the string of ponds along Totteridge Lane. The pH of the area is mainly slightly acid (pH 6.9-6.1) to very acid (pH 5.5-5.1). Pebble gravel is notoriously acid and infertile. This was noted by Walker (1795) (D. Walker: General View of the Agriculture of the County of Hertford) and again by Young (1804). Hertfordshire farmers were encouraged to lime their land – free leaflets about this were distributed at the County Shows in 1924 and 1928. Liming was subsidised from 1937 to 1946. However, a meadow known as 'chalkfield' is referred to in ancient documents and seems to have lain between Whitings, Barnet and Totteridge Park.

2. Climate

Rainfall. The average annual rainfall in the district is approximately 700 mm (27.6 inches).

Temperature. Average temperatures are a few degrees lower than those of central London, although the increasing urbanisation around the periphery, particularly to the east and along the roads, tends to raise the ambient temperature to urban levels. However, over open country, as has been pointed out by Burton (1983), the temperature at night can be as much as 6°C. lower than that within a built up area.

Generally, the growing season, when the mean daily temperature reaches 5.6°C. or more, begins in the first week of March and continues until the end of November.

Pollution. Air pollution, mainly in our area by motor-car exhausts, has been measured as the level of sulphur dioxide per m^3. This was 50-100 μg in 1976-7 (Sandford 1979).

Water pollution, as has been stated by Kent (1975), is largely due to detergents. Our local brooks are not apparently much affected and the bigger ponds are mostly above the level of houses and thus unaffected by detergent. An occasional discharge of motor oil occurs in the Dollis Brook and household rubbish and oil sometimes defile the ponds on the A road (Totteridge Lane). Discharge of slurry into the Burtonhole Brook ceased in 1973 when swine fever closed Laurel Farm piggeries.

As Dony (1967) has pointed out, population growth is the most important ecological factor in areas such as Totteridge and its pressure correspondingly raises the level of pollution.

History

1. Woodland

W. Graveson, writing in 1925 (Wilmore *et al.* 1925) commented on the extensive oakwoods of south-east Hertfordshire along the border with Middlesex, which was a favourite hunting ground in the seventeenth century when deer were numerous. Only a few stands of woodland still survive in the survey area.

In the area under study survivors of the extensive hornbeam coppice/oak standard woodland for which south Hertfordshire was once famous can now only be found in assart hedgerows. Some secondary woodland of uncertain provenance is found at the Darlands nature reserve and in Mill Hill at Oakfields Wood, while sallow, ash, birch and sycamore saplings soon spring up in untended and ungrazed areas such as the north-facing slope of Holcombe Dale below Belmont School. Many of the other trees in the area have probably been planted. Uncertainty also remains about the few Scots pines on the Claygate Beds at Laurel Farm, Pine Grove and Damson Hill.

In 1718 Sir Peter Meyer of Poynters planted oaks and elms on what is now Totteridge Green and in 1727 Poynters Grove was laid out by Capability Brown (Cussans 1870-81). Remains of avenues can be seen on the green (oak and chestnut, previously with elms), near Burnhams on the common (oak and chestnut), Grange Avenue (mainly oak), north of Totteridge Park (chestnut), the lane down from St Andrews Church towards Folly Farm (lime and chestnut), and Burtonhole Lane Mill Hill (oak with a few hornbeam – probably not a planted avenue but overgrown hedgerow relics).

In 1746, Henry, 2nd Duke of Chandos, surveyed the trees on the common and the waste and recorded 195 timber trees and 114 other trees.

Trees are of course the oldest living inhabitants of the land. The oldest of these is the great churchyard yew. It is a female tree, 7.4 metres approximately (24ft 3 in) in circumference at a height of 1 metre (3 ft) and is thought to be over 1,000 years old. In 1796 it was 26 feet in girth (Lysons 1796). This was confirmed in 1876. In 1903 it was said to be 27 ft (*Victoria County History*) and in 1923 27 ft 2 in. The diminution in size in the last half century is probably due to remedial treatment in 1977, including lopping of lower branches and mechanical constriction of the trunk.

The district suffered the ravages of Dutch elm disease during the nineteen sixties, but it is interesting that the disease, in a milder form, was first identified in Britain at Totteridge in 1927 (Shirley 1975). The last English elm of the 450 in the parish, the great tree outside Gladwyn's near the village shop, came down in 1975; it was thought to have been over 400 years old. A wych elm *Ulmus glabra* still survives in the grounds of the old chapel site near the Dollis Brook; it flowered and fruited in 1985. English elm *U. procera* suckers, common throughout the survey area, have now reached a height of about 8-9 metres (25 ft).

2. Hedgerows

At least one old boundary hedge lies to the south of Totteridge Lane, along Pink Cottage path (public footpath No. 23). Using the dating method of Hooper (Pollard, Hooper and Moore 1974) this hedgerow is about 300 years old and, until at least 1983, included *Rosa stylosa*. Other old boundary hedges can be found north of Totteridge Lane where a once-layered wild service tree *Sorbus torminalis* can be found. Another wild service tree, with saplings, grows in Burtonhole Lane (*vide infra*). Old hedges at Brook Farm have a wild service tree and also buckthorn *Rhamnus catharticus* and a spindle tree *Euonymus europaeus* which seems long established among the field maple and dogwood.

Oakfields Wood, Mill Hill contains at least two old hedge-and-ditch formations now merged in the woodland.

3. Grassland

Salmon's *History of Hertfordshire* 1728, Cussans' *History of Hertfordshire* 1870-81, the *Victoria County History* 1912-14, Barrett's *History of Totteridge* 1934, and various manuscripts at Totteridge Public Library at Dollisfield detail the history of the large estates which comprised most of the district in the seventeenth, eighteenth and nineteenth centuries and earlier. It is known that in 1720 James, 1st Duke of Chandos, of Canon's, Edgware, patron of Handel, bought the manor of Totteridge and enclosed 135 acres of common land. Why south Hertforshire suffered enclosure so much earlier than the adjoining county of Middlesex, with its similar heavy clay soil and proximity to London, is not known. As late as 1800 20,000 of the 23,000 arable acres of Middlesex were still open field system (Gardner 1967).

Totteridge Manor Farm is thought to have run down from the ancient crossroads at St Andrew's church to the Folly Brook and westward in Totteridge Valley south of Totteridge Lane. This would be roughly the present arable land of Ellern Mede Farm and adjacent pastures. The parish of Totteridge covered 1,603 acres in 1905, of which 1424.5 acres were permanent grassland, 2 acres woodland and 20 acres arable (statistics of Board of Agriculture 1905). The present survey covers approximately 1,000 hectares (2,432 acres) of which about 600 hectares (1,500 acres) is grassland and 80 hectares (200 acres) arable. Over the generations local people have known their land as part of the 'hay country' characteristic of the wet acid clay of south Hertfordshire.

The name Totteridge indicates a ridge, along which the road (Totteridge Lane) runs to some extent on pebble which protects the clay from erosion. To the south-east is Finchley, to the north Arkley and further north-east, beyond Barnet, is Hadley, all names indicating clearings, mostly fallow land, rough pasture and cut for hay. The ground is too heavy and sticky for easy ploughing and dries out into hard baked pans with cracks. Because in earlier times the water supply created no problems, farms are characteristically scattered and not gathered together in a compact village. Up to the second world war ploughing and reseeding of grassland was frowned upon. During the war it was encouraged. There are thus probably no completely unimproved meadows in the area.

4. Wetland

Old maps show the large number of ponds which have now disappeared with increasing land drainge and urbanisation. Despite this much of the land remains marshy, especially north of Totteridge Lane. Dony (1967) commented on the difficulty of finding well-drained grassland in south Hertfordshire. But drainage continues, the water table falls, and small ponds disappear, at least three of them from the west of the parish during the course of the present study.

Topography

The principal road, Totteridge Lane, runs from The Griffin in the Great North Road at Whetstone towards The Rising Sun at Highwood Hill, Mill Hill, It divides the western part of the survey area into two, mainly farmed, sectors, one south of Totteridge Lane, the other north of it and west of Barnet Lane. A third, parkland, sector lies east of the sinuous north-south line formed by Barnet Lane, Totteridge Lane south of the church, Totteridge Green and Southover, to the meeting of the Dollis and Folly Brooks. The fourth sector comprises Totteridge Manor land, owned by Totteridge Manor Association, and consisting of Totteridge Common fringing the western part of Totteridge Lane, Totteridge Green and Coppice, and other verges of Totteridge Lane. For convenience St Andrews churchyard and the chapel site are included in sector 4 (Fig. 3 inset).

Although these four sectors contain a variety of habitats each has a distinctive character of its own.

Much of the area covered is privately-owned land and in many cases access has not been possible; this includes arable fields, golf courses, gardens and the grounds of private houses. However, enquiries about inaccessible areas have not revealed unexpected findings in their flora, except for a wild service tree *Sorbus torminalis* on the South Herts. golf course.

The Survey

Sector 1: South of Totteridge Lane

This is Totteridge Valley, mainly farm land, up to a quarter of it arable, the rest mainly ley, and nearly all 'improved'. An exception is Holcombe Dale, around

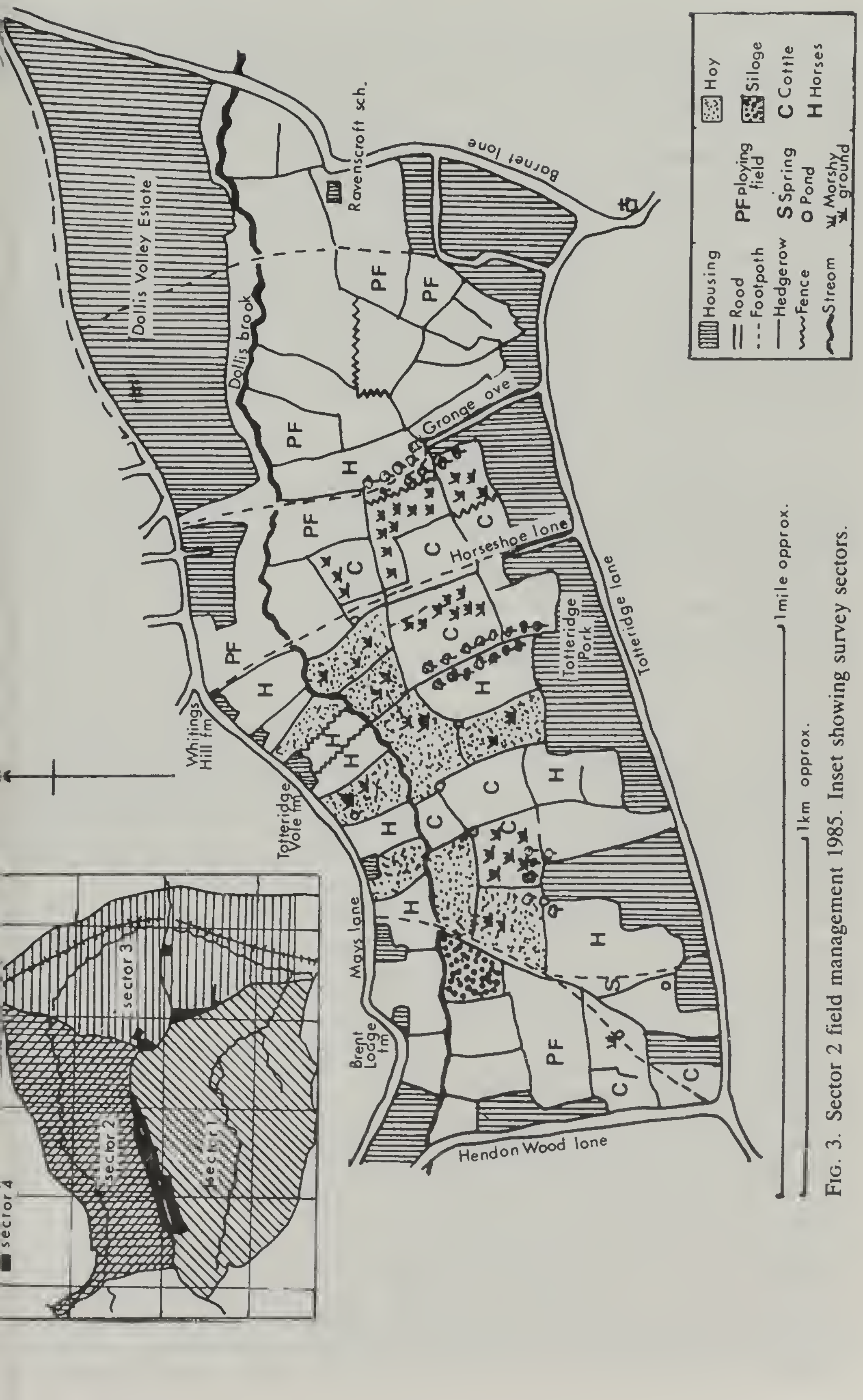

FIG. 3. Sector 2 field management 1985. Inset showing survey sectors.

the source of the Folly Brook in the west, where a wet meadow flora, including tormentil *Potentilla erecta*, great burnet *Sanguisorba officinalis*, pepper saxifrage *Silaum silaus*, brooklime *Veronica beccabunga*, devil's bit scabious *Succisa pratensis*, sneezewort *Achillea ptarmica*, jointed rush *Juncus articulatus* and oval sedge *Carex ovalis*, survive permanent grazing by horses.

Footpaths crossing the valley between Totteridge and Mill Hill through the farmland are bordered in places by old hedges and old-fashioned cornfield weeds such as field poppy *Papaver rhoeas*, charlock *Sinapis arvensis*, field pansy *Viola arvensis* and wild chamomile *Matricaria recutita*. A downy rose *Rosa tomentosa* grows in the Warren path (public footpath no. 24).

In living memory bee orchid *Ophrys apifera* could be found in meadowland to the south near the source of the Burtonhole Brook (F. R. Pratt, personal communication). This brook is fringed for much of its length by wild angelica *Angelica sylvestris* and brooklime *Veronica beccabunga*. The last cowslip *Primula veris* in the survey area was still flowering in Burtonhole Lane in 1985, most of its fellows having disappeared under a picnic site created by the Herts./Barnet Green Belt management experiment of the Countryside Commission. The nearest colony of cowslips is now at Moat Mount.

The only wooded parts of the district are found in Sector 1, at Oakfields Wood, north of Belmont School, and north of St Paul's Church, all three in Mill Hill, as well as the Darlands Nature Reserve in Totteridge. Darlands is well-known for its snakeshead *Fritillaria meleagris* which is said to have grown in the meadows all along the valley in the eighteenth century; and only in Darlands Woods can one still find yellow archangel *Lamiastrum galeobdolon*.

Our other nature reserve, Woodridge, is also in Sector 1. Wood anemone *Anemone nemorosa* grows there (in open meadowland) as well as at the Darlands, but nowhere else in the survey area.

The flora at the right-angle bend in Burtonhole Lane is interesting as illustrating typical seepage line, great horsetail *Equisetum telmateia* with bristly oxtongue *Picris echioides* and prickly lettuce *Lactuca serriola* in the clay cracks. Further south Burtonhole Lane is bordered by what appear to be characteristic assart hedgerows, with field maple *Acer campestris*, wild service tree *Sorbus torminalis*, common oak *Quercus robur* and hornbeam *Carpinus betulus*, and a ground flora of extensive ramsons *Allium ursinum* and dog's mercury *Mercurialis perennis*. Until the lane was metalled in 1983 swinecress *Coronopus squamatus* and marsh cudweed *Gnaphalium uliginosum* were also present.

Sector 2: North of Totteridge Lane and west of Barnet Lane

This is the Dollis Valley. In its eastern half, the land between Mays Lane and the brook is park-like and the flora unexceptional. The western half of the land between Mays Lane and the brook and all the land between the brook and Totteridge Lane is farmland and relict farmland.

To the east of Grange Avenue these fields were farmed until 1978 and, despite the presence of Barnet Fair and other occasional visitations by Travellers, and an extensive fire in 1982, the field edges still show relics of cultivation such as fodder burnet *Sanguisorba minor* s.s. *muricata* and of its weeds such as white mustard *Sinapis alba* and wild radish *Raphanus raphanistrum*. In the fields themselves sown grasses *Lolium perenne* and *Phleum pratense* predominate. This area is near Ravenscroft School and Dollis Valley Estate and is much used for recreation. It is gradually assuming a park-like character.

The part of Sector 2 west of Grange Avenue deserves special study (Fig. 3). Despite some recent drainge and scrub clearance, and the disappearance of ponds in several fields, new springs tend to appear after heavy rain and much of the ground is marshy especially in the eastern part where marsh yellow cress *Rorippa palustris*, square stemmed St John's wort *Hypericum tetrapterum*, brooklime *Veronica beccabunga*, corn mint *Mentha arvensis*, hoary ragwort *Senecio* *erucifolius,* fleabane *Pulicaria dysenterica,* jointed rush *Juncus articulatus* and oval sedge *Carex ovalis* can all be found. A large patch of harebell *Campanula rotundifolia* occurs on the upper southern slope near Horseshoe Lane. Further west are large stands of devil's bit scabious *Succisa pratensis* and pepper saxifrage *Silaum silaus.* Ragged robin *Lychnis flos-cuculi,* tormentil *Potentilla erecta,* burnet saxifrage *Pimpinella saxifraga* (on the upper slopes) and sneezewort *Achillea ptarmica* are widely distributed. One remaining small pond has common spike rush *Eleocharis palustris* and in 1985 still had common water crowfoot *Ranunculus peltatus.* There is a large patch of creeping Jenny *Lysimachia nummularia* near by. Several ditches also have watercress *Nasturtium* spp.

Old double hedge-and-ditch boundaries can be found west of Grange Avenue. Apart from a few playing fields and horse-grazed pastures around the periphery, the fields are traditionally managed, grazed by cattle and cut for hay. Mowing tends to be late on this north-facing slope, so allowing wild flowers to seed and spread. Herbicides have probably not been used for several years. The dominant grasses are typical hay meadow species: *Festuca rubra, Holcus lanatus, Agrostis capillaris* and *A. stolonifera* with some *Cynosurus cristatus, Deschampsia caespitosa, Anthoxanthum odoratum* and *Alopecurus geniculatus* in the wetter parts, and occasional *Phalaris arundinacea* in the ditches.

Hedges of hawthorn, (*Crataegus laevigata* as well as *C. monogyna*), blackthorn, hazel, field maple, crab apple, hornbeam and elder, with rose (mostly field rose *R. arvensis*), honeysuckle, white and black bryony, bramble, and many large oaks enclose the meadows which in summer are bright with moon daisies, bird's-foot trefoil, knapweed, buttercups, vetches, sorrel and clover (as well as the less common species described above) and clouded with butterflies.

This area has been described by one professional botanist as 'classic English countryside – fine hedges, green lanes, old pastures – an area of great interest and value' (A. D. R. Hare, personal communication).

Sector 3: The Eastern Parklands

This sector is made up of the South Herts. golf course, Brook Farm public open space, Whetstone Stray public open space, Swan Lane recreation ground, a few horse-grazed fields along Barnet Lane, and waste ground fringing the Dollis Brook to the south. The larger part is open parkland with trees. A few old allotments lie to the east of Whetstone Stray and old orchards along the Dollis Brook between the south end of Whetstone Stray (Laurel View) and the meeting of the Folly and Dollis Brooks in Woodside Park. The rest of the sector is heavily built up (Fig. 1).

Brook Farm, with a few old hedges containing field maple *Acer campestre,* spindle tree *Euonymus europaeus,* buckthorn *Rhamnus catharticus,* sloe *Prunus spinosus,* wild service tree *Sorbus torminalis* and dogwood *Cornus sanguinea,* has goldilocks *Ranunculus auricomus,* dewberry *Rubus caesius* and marsh woundwort *Stachys palustris* down by the brook. Recently, celery-leaved crowfoot *Ranunculus sceleratus,* marsh yellow cress *Rorippa palustris* and marsh cudweed *Gnaphalium uliginosum* have appeared on the spoil heap of a new bicycle track. The main grassland contains several playing fields and is frequently cut; it contrasts with neighbouring Whetstone Stray in having mat forming speedwells *Veronica* spp. as the most noticeable colourful flowering plant of the sward.

On Whetstone Stray, which is less often, or early, cut, drifts of lady's smock *Cardamine pratensis* are still able to flower. They are accompanied by field woodrush *Luzula campestris.* Autumnal hawkbit *Leontoden autumnalis* is also common at Whetstone Stray but not at Brook Farm.

Both these public open spaces have the usual quota of garden outcasts, notably a large patch of snowdrops *Galanthus nivalis* near the Brook Farm tennis courts. The mound on Whetstone Stray opposite Totteridge station has several square metres of meadow cranesbill *Geranium pratense* and two bushes of sweetbriar *Rosa rubiginosa*. The adjoining old allotments are becoming a grove of Turkey oak *Quercus cerris*.

The Dollis Brook through Whetstone Stray and the old orchards and rough ground south of it, although suffering from creeping canalisation, is fringed by field maple *Acer campestre*, hawthorn *Crataegus monogyna* and *C. laevigata*, alder *Alnus glutinosa*, hazel *Corylus avellana*, oak *Quercus robur* and ash *Fraxinus excelsior* with a woodland ground flora of dog's mercury *Mercurialis perennis*, bluebell *Hyacinthoides non-scripta*, ransoms *Allium ursinum* and lords and ladies *Arum maculatum*. In the thicket and rubble between the brook and houses south of Whetstone Stray old man's beard *Clematis vitalba*, common St John's wort *Hypericum perforatum* and yellow toadflax *Linaria vulgaris* occur together with the tall melilot *Melilotus altissima*, white melilot *Melilotus alba* and goat's rue *Galega officinalis* which were earlier also found in the verges of Totteridge Lane.

Swan Lane recreation ground Whetstone has a good deal of, presumably planted, butcher's broom *Ruscus aculeatus;* but also a large ditch where watercress *Nasturtium* sp. and fool's watercress *Apium nodiflorum* flourish, and a paddling pool with fish and pond weed *Potamogeton natans*. North of Totteridge Lane, Totteridge station, which underwent considerable structural and landscaping changes after a landslip in 1982, has hemlock *Conium maculatum* and water betony *Scrophularia auriculata* beside the up platform as well as the field poppy *Papaver rhoeas* (on the drier slope) which might reasonably be expected. Nearer the High Road, Waitrose car park contains common fumitory *Fumaria officinalis*, white campion *Silene alba*, hemlock *Conium maculatum* and hop *Humulus lupulus*.

Sector 4: Totteridge Manor land, St Andrew's churchyard and the Chapel site grounds

The manor lands comprise the Common, the Green and Coppice, and most of the Totteridge Lane verges. The latter, in 1980 some of the best local examples of hedge, wall, and rough grassland flora, are now much diminished by spraying, mowing and in some places actual 'gardening'. Sweet woodruff *Galium odoratum* clings on in one place under an old holly hedge while quite a lot of ivy-leaved toadflax *Cymbalaria muralis* still grows on walls between the churchyard and the Green. In the rougher verges, not so closely related to houses, particularly on the pebble gravel northern verges of Totteridge Lane, can be found bracken *Pteridium aquilinum*. male fern *Dryopteris filix-mas*, gorse *Ulex europaeus*. black medick *Medicago lupulina*, agrimony *Agrimonia eupatoria*, upright hedge parsley *Torilis japonica*, stone parsley *Sison amomum*, and scarlet pimpernel *Anagallis arvensis*.

Totteridge Green is being progressively drained. Laurel Farm pond is the only survivor of several ponds present on the Green in living memory (Wendy Seabrook, personal communication). In an area closely surrounded by houses such as this, it is difficult to determine where plants have been introduced as may be the case with the yellow flag *Iris pseudacorus* at Laurel Farm, winter heliotrope *Petasites fragrans* near The Dell, and *Corydalis solida* beside the Old House. But it is unlikely that the great burnet *Sanguisorba officinalis* and lesser marsh bedstraw *Galium palustre* which are still present on the Green are other than native. Other locally uncommon plants found on the Green are goldilocks *Ranunculus auricomus*, old man's beard *Clematis vitalba*, common violet *Viola riviniana*, meadow cranesbill *Geranium pratense* and goat's beard *Tragopogon pratensis*. The Coppice is a small spinney adjoining the cricket field with an undistinguished flora dominated by sycamore *Acer pseudoplatanus* and ivy *Hedera helix*.

On Totteridge Common the main interest lies in the ponds at least two of which contain fish. The Long Pond (165 metres × 40 metres approximately) is regularly fished and its banks are becoming eroded although fool's watercress *Apium nodiflorum,* water mint *Mentha aquatica,* gipsywort *Lycopus europaeus,* trifid bur marigold *Bidens tripartita* and bur reed *Sparganium erectum* are still present. The pond itself has not been fully investigated in this survey but contains what seems to be white water lily *Nymphaea alba.* Water soldier *Stratiotes aloides* is spreading from the western end. Other ponds grow great reedmace *Typha latifolia* with a dense surface growth of water starwort *Callitriche stagnalis* and duckweed *Lemna polyrhiza* and *L. minor.*

An interesting marsh flora lies on the Common between Ellern Mede farm and the Long Pond. Here lesser spearwort *Ranunculus flammula,* celery leaved crowfoot *R. sceleratus,* watercress *Nasturtium* sp. bog stitchwort *Stellaria alsine,* common hedge bedstraw *Galium mollugo,* lesser marsh bedstraw *G. palustre,* water plantain *Alisma plantago-aquatica,* jointed rush *Juncus articulatus,* hammer sedge *Carex hirta* and oval sedge *C. ovalis* are all found. Further east a large patch of creeping yellow cress *Rorippa sylvestris* grows.

The Common west of Ellern Mede Farm has been 'improved' with uniform grass and planted conifers. The dominant species is *Agrostis stolonifera.* At the extreme west the sward does not seem to have been treated so diligently and a number of rough grassland species including burnet saxifrage *Pimpinella saxifraga* occur.

St Andrew's churchyard, although mostly 'improved', contains several clumps of primrose *Primula vulgaris,* the only sweet violet *Viola odorata,* yellow pimpernel *Lysimachia nemorum* and barren strawberry *Potentilla sterilis,* in the survey area, and a large patch of *Potentilla erecta × reptans.*

The chapel site, which has been derelict land since 1960, has more naturalised primroses *Primula vulgaris* and is notable for a wych elm *Ulmus glabra* still flowering.

Conclusions

In reviewing the records made during this study one is struck anew by the obvious omissions due to the absence not of the plant, presumably, but of the surveyor. This is particularly noticeable in the western part of Sector 2, mostly privately owned (and farmed) land on which one does not wish to intrude too often. One can only hope that the ancient hay meadows and pastures of this area will remain in their present form. It is salutary to remember that less than half a century ago nearly the whole 1,000 hectares of the survey area were like the west part of Sector 2, (approximately 100 hectares). Even thirty years ago probably 600 hectares was traditional meadowland with enclosure hedges still intact. The threats of 'improvement' and 'development' are always with us.

Acknowledgements

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APPENDIX

Species List

Names and sequence follow Clapham, Tutin and Warburg (1981). Only plants apparently established are listed. Those well-established at the beginning of the survey and since disappeared are marked †. Plants marked * though now well-established, started presumably by deliberate human action (planted or discarded). Numbers refer to Sectors.

Equisetum arvense	1.3.
E. telmateia	1.
Pteridium aquilinum	1.3.4.
Dryopteris filix-mas	1.3.4.
D. dilatata	1.4.
**Polystichum aculeatum*	3.
Pinus sylvestris	1.2.3.4.
Taxus baccata	4. The old churchyard one *, but there are several younger ones, e.g. on the common, possibly self-sown.
Anemone nemorosa	1.
Clematis vitalba	1.4.
Ranunculus acris	1.2.3.4.
R. repens	1.2.3.4
R. bulbosus	1.4.
R. auricomus	1.3.4.
R. flammula	4.
R. sceleratus	1.2.3.4.
†*R. peltatus*	2.
R. ficaria	1.2.3.4.
?*Nymphaea alba*	4.
Papaver rhoeas	1.3.
Chelidonium majus	3.4.
**Corydalis solida*	4.
C. lutea	3.
Fumaria officinalis	3.
Brassica rapa	3.
Sinapis arvensis	2.3.4.
S. alba	2.

Raphanus raphanistrum	2.
†*Coronopus squamatus*	1.
Cardaria draba	1.3.4.
Capsella bursa-pastoris	1.2.3.4.
**Armoracia rusticana*	3.4.
Cardamine pratensis	1.2.3.
C. flexuosa	1.2.3.4.
C. hirsuta	1.3.4.
Barbarea vulgaris	1.2.3.4.
Nasturtium spp.	(probably *N. officinale* in sectors 1 and 2 *N. microphyllum* in sector 1, *N. microphyllum* × *officinale* in sector 2)
Rorippa sylvestris	3.4.
R. palustris	1.2.3.
Alliaria petiolata	1.2.3.4.
Sisymbrium officinale	1.2.3.4.
†*S. orientale*	3.4.
Arabidopsis thaliana	1.3.
Viola odorata	4. †3.
V. riviniana	3.4.
V. arvensis	1.
Hypericum perforatum	1.2.3.
H. tetrapterum	2.
H. hirsutum	1.4.
Silene dioica	1.2.3.4.
S. alba	1.3.4.
Lychnis flos-cuculi	2.
Saponaria officinalis	3.4.
Cerastium fontanum	1.2.3.4.
Stellaria media	1.2.3.4.
S. holostea	1.2.3.4.
S. graminea	1.2.3.4.
S. alsine	1.2.4.
Sagina procumbens	1.2.3.4.
Moehringia trinervia	1.2.3.4.
Chenopodium polyspermum	4.
C. album	1.2.3.4.
Atriplex patula	1.2.3.4. and garden weed
A. prostrata	1.2.3.4.
Tilia platyphyllos	4.
T. cordata	1.4.
T × *vulgaris*	1.3.
Malva sylvestris	3.4.
Geranium pratense	3.4.
**G. endressii*	3.
*†*G. phaeum*	3.
G. dissectum	1.2.3.4.
G. molle	3.
G. pusillum	3.
G. robertianum	1.2.3.4.
Oxalis europaea	3.4. garden weed
**O. corymbosa*	3.
**Impatiens glandulifera*	1.2.3.
**Acer pseudoplatanus*	1.2.3.4.
**A. platanoides*	3.
A. campestre	1.2.3.4.
**Aesculus hippocastanum*	1.2.3.4.
Ilex aquifolium	1.2.3.4.
Euonymus europaeus	3.
Rhamnus catharticus	3.
**Laburnum angyroides*	3.
Ulex europaeus	2.4.
?**Cytisus scoparius*	3.
Medicago lupulina	1.3.4.
Melilotus altissima	1.3. †4.

M. alba	3. †4.
Trifolium dubium	1.2.3.4.
T. hybridum	1.2.
T. repens	1.2.3.4.
T. pratense	1.2.3.4.
*†*Anthyllis vulneraria*	2.
Lotus corniculatus	1.2.4.
L. uliginosus	1.2.3.
Galega officinalis	3. †4.
*†*Onobrychis viciifolia*	2.
Vicia hirsuta	1.2.3.
V. tetrasperma	2.3.
V. cracca	1.2.3.4.
V. sepium	1.3.
V. sativa	1.2.3.4.
Lathyrus pratensis	1.2.3.4. and garden weed
**L. latifolius*	3.
Filipendula ulmaria	1.2.3.
**Rubus idaeus*	3.4.
R. caesius	1.2.3.
R. fruticosus	1.2.3.4.
Potentilla sterilis	4.
P. anserina	1.3.4.
P. erecta	1.2.4.
P. reptans	1.2.3.4.
P. erecta × reptans	4.
Geum urbanum	1.2.3.4.
Agrimonia eupatoria	3.4.
Sanguisorba officinalis	1.4.
**S. minor* s.s. *muricata*	2.
Rosa arvensis	1.2.3.4.
?†*R. stylosa*	1.
R. canina	1.2.3.4.
R. tomentosa	1.
R. rubiginosa	3.
Prunus spinosa	1.2.3.4.
P. domestica	1.4.
P. cerasifera	1.2.3.
P. avium	1.3.4.
Crataegus laevigata	1.2.3.4.
C. monogyna	1.2.3.4.
**Sorbus aucuparia*	2.3.4.
**S. aria*	4.
S. torminalis	1.2.3.
?**Pyrus pyraster*	1.
Malus sylvestris	1.2.3.
**Sedum album*	4.
**S. acre*	3.4.
**S. reflexum*	4.
Epilobium hirsutum	1.2.3.4.
E. parviflorum	1.3.4.
E. montanum	2.3.
E. roseum	1.4.
E. ciliatum	1.2.4.
Chamerion angustifolium	1.2.3.4.
**Oenothera erythrosepala*	3. (pavement weed)
Circaea lutetiana	1.2.3.4. and garden weed
Callitriche stagnalis	1.2.3.4.
Cornus sanguinea	1.2.3.
Hedera helix	1.2.3.4.
Chaerophyllum temulentum	3.
Anthriscus sylvestris	1.2.3.4.
Conopodium majus	1.2.3.4.
Pimpinella saxifraga	1.2.3.4.
Aegopodium podagraria	1.2.3.4.

Aethusa cynapium	2.3.4.
**Foeniculum vulgare*	3.
Silaum silaus	1.2.
Conium meculatum	3.
Apium nodiflorum	3.4.
Sison amomum	1.2.4.
Angelica sylvestris	1.3.
Heracleum sphondylium	1.2.3.4.
**H. mantegazzianum*	1.
Torilis japonica	1.4.
Bryonia dioica	1.2.3.
Mercurialis perennis	1.2.3.4.
Euphorbia helioscopia	4.
E. peplus	1.2.3.4.
Polygonum aviculare	1.2.3.4.
**P. amplixicaule*	3.
P. persicaria	1.2.3.4.
P. lapathifolium	1.2.3.4.
P. hydropiper	1.2.3.4.
**Reynoutria japonica*	1.2.3.4.
Fallopia convolvulus	1.2.3.4.
Rumex acetosella	1.2.3.4.
R. acetosa	1.2.3.4.
R. crispus	1.2.3.4.
R. obtusifolius	1.2.3.4.
R. sanguineus	1.2.
R. conglomeratus	1.2.4.
Urtica urens	3.4.
U. dioica	1.2.3.4.
**Humulus lupulus*	3.4.
**Ulmus glabra*	4.
U. procera	1.2.3.4.
Betula pendula	1.2.3.4.
B. pubescens	4.
Alnus glutinosa	1.2.3.4.
Carpinus betulus	1.2.3.4.
Corylus avellana	1.2.3.4.
**Fagus sylvatica*	1.4.
Quercus robur	1.2.3.4.
**Q. petraea*	3.
	3.
**Populus × canadensis*	1.2.3.4.
**P. alba*	1.3.
**Salix alba* s.s. *vitellina*	3.
S. fragilis	1.2.3.4.
**S. viminalis*	2.3.4.
S. caprea	1.2.3.4.
S. cinerea	1.2.3.
Primula veris	1.
?**P. vulgaris*	4.
?**Lysimachia nemorum*	4.
?**L. nummularia*	2.3.4.
Anagallis arvensis	†1.4.
Fraxinus excelsior	1.2.3.4.
**Ligustrum ovalifolium*	3.
**Vinca minor*	1.2.3.
**V. major*	1.
Symphytum officinale	3.
S. × uplandicum	3.
?**Pentaglottis sempervirens*	1.3.4.
?**Myosotis* spp.	(far from gardens) 1.3. (?*M. arvensis* in Sector 3, *M. sylvatica* in Sector 1).
Convolvulus arvensis	1.2.3.4.
Calystegia sepium s.s. *sepium*	1.2.3.4.
C. sepium s.s. *silvatica*	1.2.3.4.

Solanum dulcamara	1.2.3.4.
S. nigrum	1.3.
Linaria vulgaris	1.3.4.
Cymbalaria muralis	4.
Scrophularia nodosa	1.2.3.
S. auriculata	3.
Digitalis purpurea	1.2.3.4.
Veronica beccabunga	1.2.3.
V. chamaedrys	1.2.3.4.
V. serpyllifolia	1.2.4.
V. arvensis	4. and garden weed
V. hederifolia s.s. *lucorum*	1.2.3.4.
V. persica	1.2.3.4.
V. polita	4.
V. agrestis	garden weed 4.
**V. filiformis*	3.
Mentha arvensis	2.
M × *verticillata*	4.
M. aquatica	1.4.
Lycopus europaeus	1.2.3.4.
Prunella vulgaris	1.2.3.4.
Stachys palustris	2.3.
S. sylvatica	1.2.3.4.
Ballota nigra	1.3.4.
Lamiastrum galeobdolon	1.
Lamium purpureum	1.2.3.4.
L. album	1.2.3.4.
Galeopsis tetrahit	1.2.
Glechoma hederacea	1.2.3.4.
Teucrium scorodonia	1.
Ajuga reptans	1.2.3.4.
Plantago major	1.2.3.4.
P. lanceolata	1.2.3.4.
Campanula rotundifolia	2.
Galium odoratum	4.
G. mollugo	4.
G. palustre	1.4.
G. aparine	1.2.3.4.
Sambucus nigra	1.2.3.4.
**Symphoricarpos rivularis*	2.3.4.
Lonicera periclymenum	1.2.3.4.
Dipsacus fullonum	1.2.3.
Succisa pratensis	1.2.
Bidens tripartita	4.
Senecio jacobaea	1.2.
S. erucifolius	1.2.
S. squalidus	1.2.3.4.
S. vulgaris	1.2.3.4.
Tussilago farfara	1.2.3.4.
**Petasites fragrans*	3.4.
Puliceria dysenterica	2.
Gnaphalium uliginosum	†1.2.3.4.
Erigeron canadensis	1.4.
Bellis perennis	1.2.3.4.
Achillea millefolium	1.2.3.4.
A. ptarmica	1.2.
Tripleurospermum inodorum	1.2.3.4.
Matricaria recutita	1.2.3.
M. matricoides	1.2.3.4.
Leucanthemum vulgare	1.2.3.4.
Artemisia vulgaris	1.2.3.4.
Arctium minus	1.4.
Cirsium vulgare	1.2.3.4.
C. palustre	1.2.
C. arvense	1.2.3.4.

Centaurea nigra	1.2.3.4.
**†Cichorium intybus*	3.
Lapsana communis	1.2.3.4.
Hypochaeris radicata	1.2.3.4.
Leontodon autumnalis	1.2.3.4.
L. hispidus	1.
L. taraxacoides	1.
Picris echioides	1.4.
Tragopogon pratensis	1.2.3.4.
Lactuca serriola	1.
Sonchus arvensis	1.4.
S. oleraceus	1.2.3.4.
S. asper	1.4.
**Cicerbita macrophylla*	3.
Hieraceum pilosella	2.4.
**H. brunneocroceum*	4.
Crepis vesicaria	3.
C. capillaris	3.4.
Taraxacum officinale	1.2.3.4.
Alisma plantago-aquatica	1.2.3.4.
**Stratiotes aloides*	4.
Elodea canadensis	3.
Potamogeton natans	3.
?**Fritillaria meleagris*	1.
**Ruscus aculeatus*	3.
Hyacinthoides non-scripta	1.2.3.4.
**H. hispanica*	4.
Allium ursinum	1.3.
**A. schoenoprasum*	3.
Juncus bufonius	1.2.4
J. inflexus	1.2.
J. effusus	1.2.3.4.
J. conglomeratus	1.2.4.
J. acutiflorus	1.2.4.
J. articulatus	1.2.4.
Luzula campestris	2.3.4. and garden weed
**Galanthus nivalis*	3.4.
Iris pseudacorus	1.4.
Tamus communis	1.2.
Arum maculatum	1.2.3.4.
Lemna polyrhiza	4.
L. minor	1.2.3.4.
Sparganium erectum	4.
Typha latifolia	1.2.3.4.
Eleocharis palustris	2.
Carex pendula	1.2.
C. hirta	1.2.4.
C. otrubae	1.
C. ovalis	1.2.4.
Festuca pratensis	4.
F. arundinacea	1.
F. gigantea	3.
F. rubra	1.2.3.4.
Lolium perenne	1.2.3.4.
L. perenne s.s. *multiflorum*	1.3.
Poa annua	1.2.3.4.
P. nemoralis	1.
P. compressa	1.
P. pratensis	1.2.3.4.
P. trivialis	1.2.4.
Dactylis glomeratus	1.2.3.4.
Cynosurus cristatus	1.2.
Melica uniflora	1.4.
Glyceria fluitans	1.2.4.
Bromus sterilis	1.2.3.4.

B. ramosus	3.
B. hordeaceus	1.
Elymus repens	1.2.3.4.
Hordeum murinum	1.2.3.4.
Avena fatua	1.
Arrhenatherum elatius	1.2.3.4.
Trisetum flavescens	1.4.
Deschampsia caespitosa	1.2.3.4.
Anthoxanthum odoratum	1.2.3.4.
Holcus lanatus	1.2.3.4.
H. mollis	1.2.4.
Agrostis canina	1.2.
A. capillaris	1.2.
A. gigantea	2.
A. stolonifera	1.2.3.4.
Phleum pratense	1.2.3.4.
Alopecurus pratensis	1.2.3.4.
A. geniculatus	1.2.
Phalaris arundinacea	2.3.

Book Review

British Naturalists' Association Guide to Woodlands. By J. L. Cloudsley-Thompson. The Crowood Press, Ramsbury, Marlborough, Wiltshire. 1985, 128 pp., 58 colour photos and 54 black and white photos, 30 diagrams and drawings. £7.50. ISBN 0 946284 16 4.

This is an elementary but stimulating account of the natural history of woodlands. It is explained with a simple clarity which is refreshing, and is very readable. There are six chapters on various aspects of woodland i.e., the origins of woodland, the types of woodland, soils, invertebrates, birds and mammals, and woodland ecology.

It is indicated how various species relate to one another and the factors noted that affect their well being and dictate their absence or presence. There are also sections on food webs, seasonal changes, and animal camouflage. Interesting facts are pointed out, such as the many ways in which insects eat vegetation, and suggestions are made as to why certain herbs, shrubs and trees have more spiders than others.

Various subjects await investigation by amateur naturalists. 'Many aspects of the ecology of snails and slugs are little known and would repay further study.' 'The intensity of predation in nature is uncertain, so any field observations are well worth recording.' 'There is considerable scope for investigations of the numbers of millepedes in different types of woodland.' Many aspects of the biology of false scorpions provide suitable subjects for study by amateurs. The author concludes by saying 'Each original observation — when shared with others through the medium of natural history societies — may lead to the formulation of some new concept that enhances the total understanding of nature.'

The photographic illustrations are well printed, the diagrams and drawings are well arranged and all are very clear. This little book is an interesting introduction to woodlands, covering a wide field, and many experienced naturalists would learn something from it.

Geoffrey Beven

(Also received in the B.N.A. Guide series, *Wildlife in Towns* by Ron Freethy and *Coast and Shore* by Brian Barnes, at £7.95 each, 1986. Ed.).

Hay Meadow Flora at Fryent Country Park, Middlesex

by L. R. Williams*

Summary

A hay meadow flora survey of 28 fields of total area 59 hectares was undertaken at Fryent Country Park, London Borough of Brent, Middlesex in 1985 following a preliminary survey in 1984. All fields were on London Clay but varied greatly in size. Ninety-eight species were recorded with a range of 25-43 species per field and an average of 35. The distribution of the species is tabulated. Percentage frequencies for some species are discussed based on their occurrence in 20 one-metre square quadrats thrown at random in each field. Most of the meadows had a flora suggesting reverted pasture. This is discussed in relation to past land use and ploughing, and to the present management for a hay crop. Some fields appeared to have a more traditional history as hay meadows and had populations of the local *Sanguisorba officinalis* great burnet, the distribution of which is discussed.

Introduction

Hay meadows form the largest habitat at Fryent Country Park (formerly Barn Hill/Fryent Way Open Space), a countryside area of about 103 hectares managed by the London Borough of Brent for nature conservation and public recreation. Other habitats include woodland, hedgerows and old farm ponds, with all of the Country Park except for part of the woodland being on London Clay. The Country Park lies about 15 km north-west of central London, is surrounded by suburbia and bisected by the A 4140 (Fryent Way). The 28 hay meadows cover a total area of about 59 hectares after allowing for flail mowed field edges. Little previous work had been undertaken on these meadows until this survey. Since this survey commenced, two of the fields with a combined area of 3.4 hectares have been developed for public events and car parking purposes.

Methods

Grassland surveys are concerned with recording what is present and monitoring any changes for the benefit of future management work plans or for research purposes. Duffey *et al.* (1974) considered that simple observations were often better than sophisticated recording methods, especially as the time resources are seldom available for detailed work. In such circumstances the suggested method was to use 20 quadrats at random or thrown about at random and giving the percentage frequency of occurrence of each species. Frequency is defined as an estimate of the likelihood of a plant species occurring in a quadrat of predetermined size, thrown at random in an area of vegetation. A species found in nine of the twenty quadrats would have a frequency of 45%. Frequency in this context does not refer to the numerical abundance or to the percentage cover of a species.

At Fryent Country Park a preliminary survey in 1984 was largely concerned with establishing a suitable recording method for future years. Species present were recorded by compiling a species list for each field and from opportunistic records. However, more species were found when a series of one-metre square quadrats were used and the method described above (Duffey *et al.* 1974) was found to be the most appropriate of the quantitative methods tried. This method was used in the 1985 survey, with species not recorded in any of the 20 quadrats, but present elsewhere in the field being noted.

A few precautions were necessary. To approximate to random, quadrats were thrown at approximately equal distances throughout the field. The field edges

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within about two metres of the hedges were avoided, as were other atypical features. Plants did not necessarily have to be rooted within the quadrat to be counted. The survey was undertaken between April and September 1985 with all the quadrat survey work for fields cut for hay in 1985 undertaken between 19 June and 10 July. Hay cutting commenced on 9 July and was completed on 4 August following delays associated with wet weather. Some of the fields not cut for hay were surveyed after 10 July.

During 1985 the Nature Conservancy Council published a handbook (Smith, Wells and Welsh 1985) on grassland monitoring methods. Their preferred method was to use two permanently marked, 1m × 1m quadrats in each grassland community with a full vascular plant and bryophyte species list. Domin cover abundance ratings would be estimated for all the species within the quadrat and additional species in a 2m × 2m area enclosing the 1m × 1m quadrat would also be recorded. The use of photographic quadrat records produced annually was also suggested. However, for various reasons, it was considered impractical to have permanently marked quadrats at Fryent Country Park. It is therefore intended to continue the method used in 1985 in future years, but as the large majority of species were recorded in the first 10 quadrats in any field and as the frequencies for most species are about the same whether 10 or 20 quadrats are used, the number of quadrats per field may be reduced to 10.

Results

It would be impractical to tabulate all the data, especially as any trends may only become apparent after a number of years of monitoring. This paper is primarily concerned with the presence of species in the meadows, as given in Table 1. Frequencies are referred to in the text where considered appropriate. No quantitative data were available for Pages field.

The field names are given in Figs 1-2 together with the reference letter used in Table 1. As far as possible the names follow the 16th century names (Williams and Cunnington 1985), though some have since been split by Fryent Way. Where field shapes have changed or a number of fields were under the same ownership, appropriate later names have been used. Note that Barn Hill and Saltcroft are not hay meadows. Meade West is now a surfaced car park and those species which were present in 1984 must now be considered extinct as meadow species. Upper Hydes East has been levelled, drained and re-seeded with a *Lolium perenne* perennial rye-grass/*Trifolium repens* white clover mix, so some of the meadow species recorded there in 1984 are now also considered extinct. The 1985 survey of this field refers to a sub-area of about 0.5 hectare that was left as meadow. In interpreting the results consideration should be given to the great variation in field sizes which ranged from 0.1 to 8.3 hectares with an average of 2.1 hectares. The order and scientific names of species mentioned in this paper follow Clapham, Tutin and Warburg (1981).

There were four pairs of species for which the accuracy of separating the two members of each pair improved as the survey progressed. Although this was unlikely to have affected the presence/absence results, the frequencies of these species for the earlier surveyed fields may be unreliable. These pairs were:

Ranunculus acris meadow buttercup and *R. repens* creeping buttercup
Vicia hirsuta hairy tare and *V. tetrasperma* smooth tare
Rumex crispus curled dock and *R. sanguineus* red-veined dock
Phleum pratense large-leaved cat's-tail and *P. bertolonii* small-leaved cat's-tail.

Species considered to have some interest in their distribution are considered below.

Ranunculus acris meadow buttercup and *R. repens* creeping buttercup were common in most fields. No buttercups were recorded in Lyon field and only a few individuals were present in Honey Slough West. Although no data are available the buttercups have shown a dramatic visual reduction in recent years.

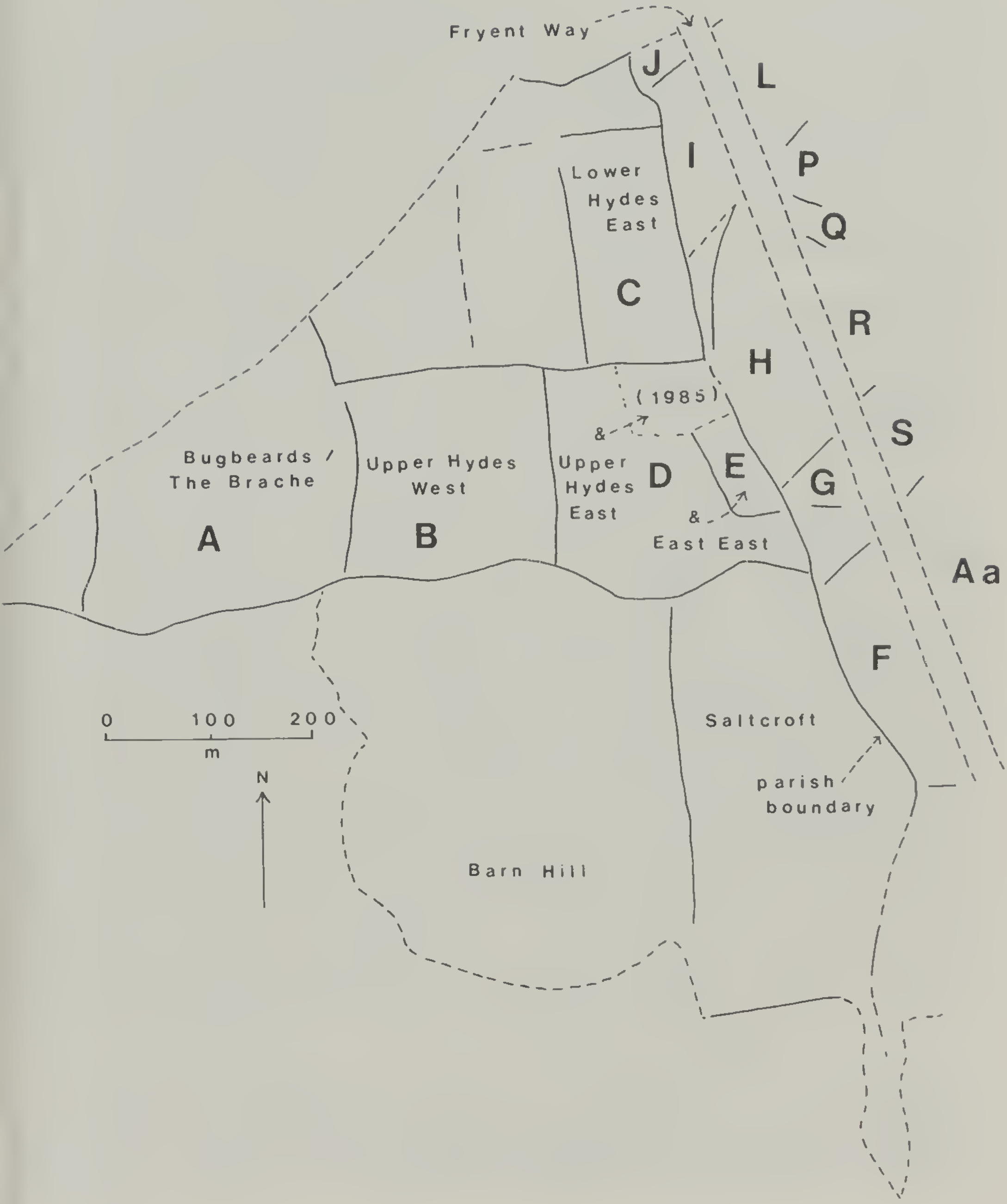

FIG. 1. Field names and reference letters for the Harrow parish side of Fryent Country Park.

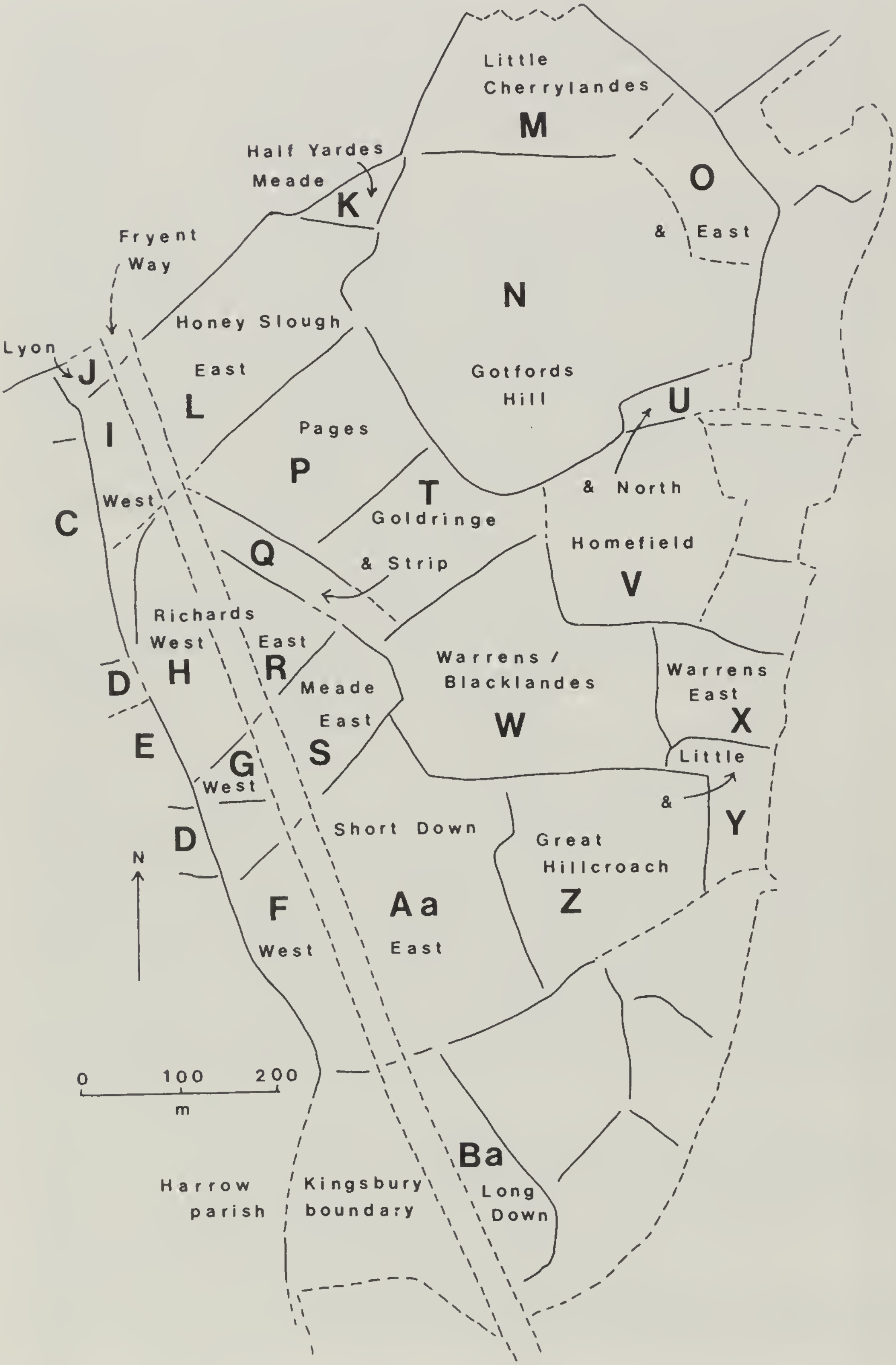

FIG. 2. Field names and reference letters for the Kingsbury parish side of Fryent Country Park.

Photographs taken in 1982 show that at their seasonal peak, buttercups (mainly *R. acris*) were the dominant flower in some fields with virtually no other species visible above a sheet of yellow. In 1983 the display was almost as good. A photograph in Bethell and Scoones (1984), considered to have been taken in or about 1983, shows Short Down East and Great Hillcroach in the foreground with a dominance of *R. acris* and *Alopecurus pratensis* meadow foxtail. In 1984 the buttercup display was patchy, while in 1985 the grassland turned tawny-green without first going through a yellow stage, although buttercups were present. The dominance of buttercups in earlier years (1979-83) was also confirmed by the hay-cutting contractor (G. Brook, pers. comm.). It appears that the flora of some of the meadows may be becoming more diverse at the expense of buttercups, a few years after the change from grazing to hay production.

Ranunculus ficaria lesser celandine was recorded in a few fields, usually near to the hedgerow boundaries.

Cardamine pratensis cuckoo flower was recorded in Upper Hydes West since at least 1982. A 1984 record for Upper Hydes East must now be considered extinct.

Cerastium fontanum common mouse-ear was present in almost all fields. *Stellaria media* chickweed was present in a few fields. *S. graminea* lesser stitchwort was only recorded in Lyon and in Half Yardes Meade where it had a frequency of 40%.

Geranium dissectum cut-leaved cranesbill was, with the exception of one plant found in Lyon field, unrecorded west of Fryent Way, but was present in almost all the fields east of Fryent Way. In Richards East it was found in 55% of quadrats compared with a maximum of 15% in the other fields.

Medicago lupulina black medick was present in all fields east of Fryent Way and in up to 100% of quadrats. However, it was generally infrequent west of Fryent Way and in Half Yardes Meade. *Trifolium hybridum* alsike clover was recorded in two fields. *T. repens* white clover was present in various amounts in most fields, while *T. pratense* red clover was common east of Fryent Way but less frequent on the west side where it was not recorded in some fields. *Lotus uliginosus* marsh birdsfoot-trefoil appeared to be more widespread west of Fryent Way, but was most abundant in Half Yardes Meade (frequency 25%). (The common birdsfoot-trefoil *L. corniculatus* was not recorded in any of the hay meadows although it was present elsewhere in the Country Park). *Vicia hirsuta* hairy tare was more frequent east of Fryent Way and in up to 75% of quadrats. *V. tetrasperma* smooth tare was less frequent than *V. hirsuta. V. cracca* tufted vetch occurred in a few fields with a frequency of up to 25% (Half Yardes Meade). *V. sativa* common vetch was present in all fields and in up to 90% of quadrats. *Lathyrus pratensis* meadow vetchling was recorded in most fields with maximum frequencies in Upper Hydes West (75%) and Upper Hydes East East (80%).

The only hay meadow records of *Filipendula ulmaria* meadowsweet were west of Fryent Way in fields adjacent to the Harrow/Kingsbury parish boundary hedge, within 10m of it in all except Honey Slough West; however, the plant does occur east of Fryent Way in some hedgerows. *Potentilla reptans* creeping cinquefoil was also unrecorded east of Fryent Way, but was found in all but two of the west side fields.

Sanguisorba officinalis great burnet had good populations in Honey Slough West – 10% of quadrats, Lyon – 20% and Half Yardes Meade – 25%. It also occurred in a few other fields; and in some rough grassland at the northern tip of Richards West, in the hedge ditch between Richards East and Goldringe strip, adjacent to a few other hedges and even on rough grassland adjacent to the roadside. In 1984/85 some turves were transplanted from Upper Hydes East and Meade West in a rescue operation and some of these appear to have taken in fields B,C,F,N,O,S,W,Y and Z.

Anthriscus sylvestris cow parsley was present in about half the meadows but only in small numbers. *Sison amomum* stone parsley was recorded in Lyon and Honey Slough West (frequency 15%). *Heracleum sphondylium* hogweed occurred in about a third of the fields but only in small quantities, except in Meade West where in 1983 it was one of the dominant plants although no quadrat data are available.

Rumex acetosa sorrel was more common west of Fryent Way than in the eastern fields. *R. crispus* curled dock was the most common dock, while *R. obtusifolius* broad-leaved dock was present in some fields. *R. sanguineus* red-veined dock appeared to be more frequent east of Fryent Way.

Salix spp. willows were recorded in two fields where their shoots formed part of the hay crop.

Senecio jacobaea ragwort was represented by a few plants in a few fields, while *S. erucifolius* hoary ragwort was recorded in half the fields although also only in small quantities. *Cirsium arvense* creeping thistle was recorded in all fields except one and in up to 60% of quadrats. *Leontodon autumnalis* autumnal hawkbit, present in a few fields, was recorded after the annual hay cutting. *Tragopogon pratensis* goatsbeard was present in most fields and appeared to be more frequent east of Fryent Way. *T. porrifolius* salsify may be an escape from allotments adjacent to Little Cherrylandes. It appears to be spreading within this field and in 1985 a few plants were found in Gotfords Hill. *Crepis vesicaria* beaked hawk's-beard has been recorded in five fields east of Fryent Way, but not in the western side fields. *Taraxacum officinale* dandelion was difficult to record quantitatively as the leaves often die back under the sward above by the time of the survey in June. However it was recorded in all fields except Meade West where it would now be extinct as a meadow plant.

Carex hirta hairy sedge was frequent (10%) only in Honey Slough West, but was also recorded in three other fields where it appeared to be recolonising the meadows from the boundary hedges.

Festuca pratensis meadow fescue was not recorded east of Fryent Way but was found in some west side fields and in up to 45% of quadrats. *F. rubra* red fescue was recorded both east and west of Fryent Way though it tended to be more common on the west side.

Lolium perenne perennial rye-grass usually had a frequency of 85-100%. The main exceptions were Half Yardes Meade (20%); and Honey Slough West and Lyon fields where it was unrecorded. *L. multiflorum* Italian rye-grass was found in a few fields east of Fryent Way but in small quantities. It is possible that some of the *L. perenne* may have been a hybrid or of agricultural origin.

Poa annua annual meadow-grass was not recorded in the hay meadows themselves, but was often present at the edges of the fields where used as footpaths. *P. pratensis* smooth meadow-grass was only recorded in two fields east of Fryent Way but was present in most fields west of Fryent Way with a frequency of up to 25%. *P. trivialis* rough meadow-grass was recorded in all fields and often in a majority of quadrats.

Dactylis glomerata cocksfoot, present in all fields with the possible exception of Pages, tended to be more frequent west of Fryent Way, although its highest frequency (60%) was in Half Yardes Meade. *Cynosurus cristatus* crested dog's-tail was recorded in a few fields.

Bromus sterilis barren brome was sometimes present in meadows near to the hedgerows. *B. hordeaceus* soft brome was recorded in all fields except Meade West, Honey Slough West, Lyon and Half Yardes Meade. It was more frequent (up to 90%) east than west of Fryent Way. *B. commutatus* meadow brome was unrecorded from the same fields as soft brome and from two others. It was first noticed in 1985 although it was obviously present in previous years. In Goldringe and Short Down East it was recorded in all quadrats. This is an uncommon grass in London, but characteristic of old meadows elsewhere (Burton 1983).

Elymus repens couch was recorded in all fields except two, with frequencies of 10-95%. *Hordeum secalinum* meadow barley was more common west than east of Fryent Way. *H. murinum* wall barley was found in one field probably as an escape from roadside grassland. *Arrhenatherum elatius* false oat-grass was recorded from all fields and in a maximum of 95% of quadrats. *Deschampsia cespitosa* tufted hair-grass was found in most fields with frequencies of up to 30%. *Anthoxanthum odoratum* sweet vernal-grass was first recorded in 1985 in four fields, but did not appear in any quadrats.

Holcus lanatus Yorkshire Fog occurred in all fields with the possible exception of Meade West. In most fields it had a frequency of 100%. Only in Honey Slough West was it not recorded in any quadrats. *H. mollis* creeping soft grass was found in two fields west of Fryent Way.

The bents *Agrostis* spp. were late developers in the sward. For this reason it was difficult to identify them to species level and, although recorded in most fields, the frequencies of up to 95% obtained must be regarded as unreliable as many young plants may not have been positively identified as *Agrostis*.

Phleum pratense large-leaved cat's-tail was present in most fields, but not as common as *P. bertolonii* small leaved cat's-tail which had frequencies of up to 40%.

Alopecurus pratensis meadow foxtail was present in all fields but more frequent in the western fields with frequencies of up to 100%. *A. geniculatus* marsh foxtail was present in most meadows especially near to the perimeter footpaths, possibly as a result of soil compaction and waterlogging. Within the meadow swards it was easily overlooked and only recorded within quadrats in two fields, but in one of these, Gotfords Hill East, it had a frequency of 20%.

Table 1 also lists about 35 species not mentioned in the paragraphs above and only recorded in small quantities. While some of these occurred as casuals, distribution patterns for some species may become apparent in future years. Two species, *Polygonum aviculare* agg. knotgrass and *Plantago major* greater plantain were usually found on or near to the field edge footpaths, while *Polygonum persicaria* redshank and *Anagallis arvensis* scarlet pimpernel were found on poached (disturbed) ground within the meadows.

Meadow History

Few records exist of the past land use of individual fields at Fryent Country Park, although most fields have probably been in continuous agricultural use since medieval times. Agriculture has involved arable, pasture and meadow farming. Hay meadows can be used as pasture for a few months each year (Garrett 1935), while meadow is a rather vague term which has sometimes been used to describe any field of grassland, so past records must be treated with caution. With the botanical evidence suggesting a reverted pasture type of meadow for most of the fields, land use changes during recent decades are obviously of more interest than details of field use in previous centuries. For those meadows with more sensitive species, *Sanguisorba officinalis* great burnet for example, there is a need to consider land use as far back as records permit.

The herbaceous flora of the adjacent field hedgerows has probably been fairly constant over long periods and this may be an important factor in the recolonisation of former arable land by some meadow species. Williams and Cunnington (1985) have shown how the fields were cut out of the original woodland by assarting (at least on the Kingsbury side) in medieval times. By the time of the 1597 All Souls College Hovenden Maps of Kingsbury, this process had resulted in a field and hedgerow pattern that has remained basically unchanged since, although there was more woodland in 1597 and the hedges were thicker. By this time too, the Harrow (Wembley was only a hamlet of Harrow until 1894) side fields were in existence, possibly with Great Hydes (Upper and Lower Hydes) having been one large open field.

In 1086 meadow and pasture were unimportant compared with arable in Kingsbury (Bolton 1976), although by 1350 a Honey Slough field was meadow. The conversion of arable to grassland may initially have been connected with the inclosure of arable strips and the building-up of estates. This conversion was well advanced in some areas by the late 15th century and by 1597 arable formed only 30% of the 502 hectares (1,240 acres) marked on the All Souls College map. Animal farming, with sheep and cattle, became increasingly important during the 16th century. An indenture of 1726 gives Little Hill Croft as arable, Great Hill Croft as meadow and Cowlays and Short Downs as pasture (Cunnington 1977). In the 1838 Tithe Award all the Kingsbury fields of the present Country Park area were meadow except Short Down and Dormers Mead which were arable. On the Harrow side, Bugbeards and Upper Hydes were meadow in 1724 and also in 1817 (Cunnington 1975).

The trend from arable to grassland is confirmed by Garrett (1935) in quoting records of All Souls College for 177 hectares (437 acres) of their Kingsbury estate. From 1590 until 1650 arable formed 31%, pasture 34%, meadow 8% and woodland 26%. In 1850 arable occupied 4%, grassland 93% and woodland 2%. Bolton (1971) and Hewlett (1979) suggest that the change was largely due to London's growing need for hay and meat. Hay fields occupied all of Uxendon and Forty Farms in 1852, and in the Wembley area hay production reached its peak in the 1880s.

The farmland surrounding the Country Park was built over during the suburban expansion of the 1920s and 1930s. Fryent Way cut through the Kingsbury side fields in 1935. It would appear from the Borough of Wembley Minutes (1939-52) and from T. J. Lansbury (pers. comm.) that much of the Country Park area was under rough grazing until the Second World War. By an Order of Middlesex War Agricultural Executive Committee the land east of Fryent Way was ploughed up in 1941. By 1946 wheat, oats and barley were produced at Big Bush Farm (east of Fryent Way). This arable appears to have been returned to pasture a few years after the War. On the west side of Fryent Way, including Barn Hill, cattle were grazed throughout the War and until some years after. Aerial photographs taken in April 1947 show evidence of recent ploughing on most of the east side and with Half Yardes Meade covered in allotments. The west side appeared to be more permanent grassland.

Batten (1972) mentions that dairy production continued until 1967, although in 1968 the entire east side was planted with wheat, followed by barley in 1969 and wheat again in 1970, while some fields were kept aside for grazing and hay. G. Brook (pers. comm.) remembers barley in 1971, followed by grass during most of the 1970s, while A. Ward (pers. comm.) has confirmed the grazing on the eastern side during much of the 1970s but remembers the west side as rough grassland. Thus even for the 1970s, it has not been possible to obtain accurate management records, although hay production resumed on both sides of the Country Park in about 1979.

Discussion

A total of 98 species was recorded during the survey although the average per field was 35 with a range of 25-43. Considering the quadrat data on their own the average number of species per field was 21.1 with a range of 13-26. This discrepancy is a reflection on the low frequency of a number of species which may not have fallen within any of the quadrats. The quadrat method was however effective in recording the majority of species in a field including all the common species. As was mentioned above under Methods, it is intended to reduce the number of quadrats per field from 20 to 10 for future surveys.

The average number of species per quadrat varied from 3.4 (Honey Slough West) to 10.9 (Long Down), yet more species (43) were found in Honey Slough West than in any other field. The average number of species per quadrat for all fields was 8.1. Beyond this, it is difficult to draw any conclusions from the quantitative data, especially as this was the first year of the full survey.

In duscussing the results there are a number of influencing factors to consider and while some of these are mentioned below it is probable that their effects may only be elucidated by long-term monitoring. These factors include differences east and west of Fryent Way, past and present land management, field size, the effect of adjacent hedgerows, the abundance of indicator species (both of traditional meadows and those of changing reverted pasture) and the effect of weather or other external influences.

Another consideration is the suitability of the fields as ecological recording units. While the fields are clearly defined for recording purposes and have each been homogenous agricultural units over long periods, consideration should be given to the possibility of differences within the sward in any field. Certain species such as wind dispersed introductions, for example *Tragopogon porrifolius* salsify, are unlikely to conform in distribution to historical land use. Other species appear to be associated more with adjacent hedgerows than with the meadow itself, for example *Bromus sterilis* barren brome.

While the situation may be more complex than suggested here, there appeared to be two main types of meadow, reverted pasture and traditional meadows. Most of the fields, while differing in the frequencies of individual species, were similar to reverted pasture as defined by Duffey *et al.* (1974) and possibly to ordinary dry meadows (Ratcliffe 1977). These may not necessarily have been pasture before hay production commenced, but the term is used to describe grassland which does not have a continuous management history as meadow and therefore is likely to consist of common species with very few if any species indicating traditional management. The historical records are in agreement with this interpretation. Arable, pasture and hay production have been practised in past centuries and it is probable that most of the fields have been ploughed at least twice this century.

Traditional meadows, a term used for convenience to describe the three fields of Half Yardes Meade, Honey Slough West and Lyon had a markedly different flora from the reverted pasture meadows. These include a few species tending to indicate a more continuous management as grassland, although these meadows too may not be as diverse as they once were. Indeed, it has been mentioned above that Half Yardes Meade was used for allotments in 1947 and probably throughout much of the Second World War. By the neutral grassland classification given by Ratcliffe (1977) they are nearest to calcareous clay pastures, although few of the distinctive species were present, with the exception of *Sanguisorba officinalis* great burnet which was present in quantity.

Sanguisorba officinalis great burnet is a species usually associated with old neutral grassland, especially hay meadows (Baker 1937 quoted in Sheail and Wells 1969). The evidence (Trimen and Dyer 1869, Kent 1975) does suggest that it has been long established in these fields. In London the species has been largely confined to the north-west although most of these records refer to small numbers of plants (Burton 1983). Most of the records given by Kent (1975) refer to the Upper Brent botanical division, with most of the others in the Lower Brent and Metropolitan divisions. Kent (1975) describes the species as rare and decreasing in Middlesex. It may no longer be present at Tokyngton Recreation Ground near Stonebridge Park (28T04) where it was plentiful in 1968, and Burton (pers. comm.) mentions that it cannot now be found in the two localities south of the Thames shown in Burton (1983) both of which were outside Greater London.

However there are three additional sites in north-west London, one in a cemetery at Harrow Weald, a second in Kensal Green Cemetery (28T22) (Latham 1984) and the third found during this study in the meadows and hedges at Fryent Country Park (18T86) in addition to the known records for 18T88.

Thus the historical distribution of *Sanguisorba officinalis* in Middlesex appears to have corresponded with the permanent London Clay grassland of the Brent basin and adjacent areas. Where undisturbed it has survived in small pockets of grassland, but elsewhere has been lost through urban and agricultural developments. The Country Park meadows probably contain a high proportion of the great burnet population in London. It is suggested that the presence of this species may indicate fields that escaped ploughing during the Second World War and/or the late 1960s/early 1970s. Similarly, the great burnet in the hedges would also have escaped the ploughing of their adjacent meadows and may now be recolonising some of the reverted pasture meadows. Some evidence for this suggestion comes from the distribution of great burnet in the Country Park, where it is almost invariably found within 20m of hedges and ditches, and just occasionally on disturbed (20th century) soil near to these hedges. Clearly, further research is required before these suggestions can be confirmed, but it is probable that great burnet was once more extensive over the Country Park area in a larger number of traditional meadows. It may be noted that a now scrubby field, Saltcroft, on Barn Hill itself, contains a number of old grassland indicators although no great burnet while few of the indicators present in Saltcroft were found in the traditional hay meadows.

Various difficulties have prevented the three traditional hay meadows mentioned above from being cut as part of the hay crop in recent years. Half Yardes Meade has been cut late in the season to encourage *Sanguisorba officinalis* seed production, Lyon has been cut a couple of times a year and Honey Slough West not more than once a year. For all three fields the cut material has seldom been removed. A more regular cutting, even as part of the hay crop, may be more desirable. Reverted pasture fields, where the cutting management has been disrupted in recent years, usually had a different sward composition from hay cropped fields. These included Short Down West which since about 1983 has been cut in the late spring only, with no removal of cut material. Richards West was managed as for the other hay meadows until 1984, but was cut in the spring of 1985 without the removal of the material and then poached by vehicles to some extent.

The large differences in the presence and frequencies of about 15 species in the reverted pasture fields east and west of Fryent Way, suggest differences in land use at some time since 1935 when the road was constructed and probably in the years immediately before both sides were subjected to the same hay cutting regime in about 1979. Five grass species, *Festuca pratensis* meadow fescue, *Poa pratensis* smooth meadow-grass, *Dactylis glomerata* cocksfoot, *Hordeum secalinum* meadow barley and *Alopecurus pratensis* meadow foxtail, were noticeably more frequent west than east of Fryent Way, while only one grass, *Bromus hordeaceus* soft brome, was more frequent on the east side. Three herbs, *Lotus uliginosus* marsh birdsfoot-trefoil, *Potentilla reptans* creeping cinquefoil and *Rumex acetosa* sorrel, were more frequent in the west side meadows compared with six that were more frequent on the east side, *Geranium dissectum* cut-leaved cranesbill, *Medicago lupulina* black medick, *Trifolium pratense* red clover, *Vicia hirsuta* hairy tare, *Tragopogon pratensis* goatsbeard and *Crepis vesicaria* beaked hawk's-beard.

The reverted pasture classification given to the majority of the meadows should not be taken to imply that they are of little interest to nature conservation. On the contrary, their present diversity and the hay management regime without the application of fertilisers makes them an important habitat resource. It has been mentioned that they appear to be changing rapidly from an early stage of reverted pasture to a more interesting sward. In time certain species may be noted as indicators of these changes, but even now some of the species present are usually associated with richer grassland than reverted pasture. Katherine A. Hearn (pers. comm.) has identified the following as being of possible interest: *Cardamine pratensis* cuckoo flower, *Trifolium pratense* red clover, *Lotus uliginosus* marsh birdsfoot-trefoil, *Filipendula ulmaria* meadowsweet, *Sanguisorba officinalis* great burnet, *Heracleum sphondylium* hogweed, *Centaurea nigra* black knapweed, *Carex hirta* hairy sedge and *Alopecurus geniculatus* marsh foxtail.

The Fryent Country Park hay meadows can be considered as an important habitat resource in Middlesex and London. Following the spread of London during the past century, the vast majority of Middlesex has been built over including the large area of permanent grassland on the London Clay plain in the north west of the county. Morris (1950) has chronicled the loss of meadow and farmland in Willesden between 1875 and 1939, while for the more suburban Wembley and Kingsbury to the north, the loss was during the 1920s and 1930s. The Country Park meadows are the last area of this meadowland still managed for agricultural hay production in the Upper Brent botanical division; and over much of north-west London too.

Some relic populations of old Middlesex grassland species have been mentioned above and include the Welsh Harp Reservoir, Harrow Weald and Kensal Green Cemetery. Horsenden Hill also supports some interesting species and some of the surrounding fields, of limited wildlife value due to frequent cutting, have in recent years been cut for hay once a year (London Borough of Ealing 1985). Northwick Park (18T66) appears from Kent (1975: 335, 473, 556) to have once been an area of damp grassland, but has been extensively developed this century for various purposes. There is one scrubby grassland area remaining within Northwick Park with species including *Ophioglossum vulgatum* adder's-tongue fern, *Lychnis flos-cuculi* ragged robin and *Filipendula ulmaria* meadowsweet, although outline planning permission for a temple complex has now been granted for this area.

The potential to re-create a larger area of more diverse grassland throughout the Country Park hay meadows should not be technically difficult. The annual cutting of the reverted pasture meadows without the application of fertilisers, which if applied would greatly reduce their floristic diversity, has already produced an interesting grassland community. This diversity should continue to increase and could be aided by the re-introduction of less common species from the traditional meadows or even from elsewhere. For wildlife and landscape conservation reasons, the management of the Country Park meadows should be considered in relation to the adjacent habitats with which they are so closely associated. The probable effect of the hedgerows in acting as botanical pools for some of the meadow species has been discussed above, and this almost certainly applies to invertebrate groups too, such as the butterflies, some of which may be dependent on both habitats.

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TABLE 1. Distribution of plant species in hay meadows at Fryent Country Park. P – species recorded as present in 1985. X – 1984 record only. E – recorded in 1984 but now considered extinct in that meadow.

Species	Field reference letter																											
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Aa	Ba
Ranunculus acris	P	P	P	P	P	P	E	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Ranunculus repens	P	P	P	P	P	P		P			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Ranunculus ficaria		P		P							P												X		P		P	
Cardamine pratensis		P		E																								
Cardamine hirsuta										P																		
Barbarea vulgaris									P																			
Cerastium fontanum	P	P	P	X	P	P	E	P		P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P
Stellaria media						P				P	P				P													
Stellaria graminea										P	P																	
Chenopodium sp.								P	P				P															
Geranium dissectum										P	P	P	P	P			P	P	P	P	P	P	P			P	P	P
Medicago lupulina	P	P	P	P	P		E	P			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Trifolium hybridum												P					P											
Trifolium repens	P	P	P	P	P	P		P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Trifolium pratense	P		P	P	P						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Lotus uliginosus		P	P		P	P		P	P		P	P			P									P				
Vicia hirsuta	P	P						P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P
Vicia tetrasperma	P	P												P				P						P	P			P
Vicia cracca		P	P	E	X	P		P	P	P	P	P	P		P		P		P			P						
Vicia sativa	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Lathyrus pratensis	P	P	P	P	P	P		P	P		P	P	P	P	P		P	P	P		P	P	P	P	P	P	P	P
Filipendula ulmaria			P			P		P	P																			
Rubus fruticosus	P																							P				

	Field reference letter																											
Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Aa	Ba
Potentilla reptans	P	P	P	E	P			P	P																			
Sanguisorba officinalis			P	E			E	P	P	P	P						P									P		
Epilobium hirsutum									P		P																	
Epilobium montanum													P															
Chamerion angustifolium								P																				
Anthriscus sylvestris	P	P				P			P	P	P									P		P	P		P	P	P	P
Conopodium majus																												P
Sison amomum									P	P																		
Heracleum sphondylium					P	P	E	P				P						P	P				P			P	P	P
Polygonum aviculare agg.													P													P	P	
Polygonum persicaria								P					P															
Rumex acetosa	P	P	P	X	P	P	E	P		P	P									P		P						
Rumex crispus	P	P	P	P		P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Rumex obtusifolius			P	X		P			P					P											P		P	
Rumex sanguineus									P		P		P	P	P										P	P		
Urtica dioica							E	P	P	P									P		P		P	P	P			
Salix sp.				E																						P		
Anagallis arvensis								P					P															
Convolvulus arvensis									P																			
Calystegia sepium											P																	
Scrophularia nodosa									P																			
Prunella vulgaris								P																				
Stachys sylvatica									P																			

	Field reference letter																											
Species	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Aa	Ba
Glechoma hederacea						P																						
Plantago major								P			P														P	P	P	
Plantago lanceolata														P							P					P		
Galium aparine									P	P	P																	
Bidens tripartita									P																			
Senecio jacobaea						P								P														P
Senecio erucifolius	P	P			P	P		P	P			P	P	P		P	P	P					P				P	
Aster novi-belgii																												P
Bellis perennis														P													P	
Achillea millefolium																					P							
Tripleurospermum inodorum								P																				
Matricaria recutita																						P					P	
Artemisia vulgaris			P						P			P	P															
Cirsium vulgare						P																						
Cirsium arvense	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P
Centaurea nigra																											P	
Hypochaeris radicata	P		P	P							P	P					P		P			P	P					
Leontodon autumnalis																P							P					P
Picris echioides						P		P			P		P							P						P	P	P
Tragopogon pratensis	P		P	E		P		P				P	P			P		P	P	P		P	P	P	P	P	P	P
Tragopogon porrifolius													P	P														
Lactuca serriola									P		P																	

Species	Field reference letter																											
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Aa	Ba
Crepis vesicaria																P					P	P				X		P
Taraxacum officinale	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Asparagus officinalis																									P			
Juncus effusus											P																	
Juncus conglomeratus						P			P					P	P								P			P	P	
Carex hirta		P							P			P															P	
Festuca pratensis			P		P	P		P																				
Festuca rubra	P	P	P																							P		
Lolium perenne	P	P	P	P	P	P	E	P			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Lolium multiflorum												P				P										P		
Poa pratensis	P	P	P	P	P	P		P	P			P	P															
Poa trivialis	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Dactylis glomerata	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Cynosurus cristatus	P	P	P	E	P							P	P	P									P		P	P	P	
Bromus sterilis																		P					P					P
Bromus hordeaceus	P	P	P	P	P	P		P				P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Bromus commutatus	P	P	P	P	P			P				P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Elymus repens	P	P	P	P	P	P			P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Hordeum secalinum	P	P	P	P	P			P	P						P								P			P		X
Hordeum murinum																											P	
Arrhenatherum elatius	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Deschampsia cespitosa	P	P	P	P	P		E		P		P	P		P	P	P	P	P	P				P	P		P	P	P
Anthoxanthum odoratum					P								P		P		P											

Species	Field reference letter																											
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Aa	Ba
Holcus lanatus	P	P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Holcus mollis		P	P																									
Agrostis sp.	P		P	P	P	P		P	P	P	P	P	P		P	P	P	P	P	P		P	P	P	P	P		P
Phleum pratense				P	P	P			P	P	P	P		P	P	P		P	P		P		P				P	P
Phleum bertolonii	P	P	P	P		P		P	P		P	P	P	P	P		P	P	P	P	P	P	P	P	P	P	P	P
Alopecurus pratensis	P	P	P	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Alopecurus geniculatus	P		P	P	P						X	P	P	P	P	P	P		P	P	P	P				P	P	P

Book Review

The Butterflies of Berkshire, Buckinghamshire and Oxfordshire. By Caroline and David Steel. Illustrated by Peter Creed. Pisces Publications, Oxford. 1985. 80pp. 8 col. pls. 50 text drawings. 50 maps. £4.00 paperback. ISBN 0 9508245 3 4.

Books on butterflies are always popular, not only with butterfly specialists, but also with enthusiasts in other disciplines of natural history as well as with the layman. This latest publication however, will also be of great interest to members of the London Natural History Society, for not only does a part of the area covered overlap with our own recording circle, but also many members frequently visit parts of the three counties covered for leisure purposes. There is further advantage in that this book is written with the general readership firmly in mind, whilst still presenting a factual statement on the status and distribution of the fifty-nine species recorded, past and present, in the region. It opens with a three-page introduction and asks the highly pertinent question — 'What is a butterfly?'. I wonder how many books allegedly aimed at the general public recognise that many people would be unable to answer that question correctly? Photography is, commendably, urged as a substitute for collecting, although the authors quite correctly point out that collecting does no long term damage to butterfly populations. A guide, not to identification of the butterflies themselves, but to how butterflies are identified, is a useful inclusion, and urges the reader to pay attention to flight period and habitat as well as the usual morphological aspects. A short paragraph on the best butterfly spots in the region then follows, although this is little more than a short summary which could usefully have been expanded.

The section on distribution is introduced with a map of the surface geology of the counties, which sadly is on a different scale to all the other maps in the book, and the relevance of this to the distributions of several species is illustrated by the map of silver-studded blue, shown as being restricted here to the London clay and tertiary gravels of Berkshire. Other interpretations of distribution would have been greatly facilitated had grid lines not been omitted from the geological map, and it is a pity too, that these two maps are not on the same page, or at least facing each other. The numbers of species in the 79 ten-kilometre squares covered by the book are also presented in map form, and range from 42 in the centre, down to 7 in one of the marginal squares which is only partly in the study area, (an average of 30 per square). A brief chapter on the changes in status and distribution of the various species makes very interesting reading, and is summarised in a table on page 11 before continuing with a chapter on conservation, particularly the effects of habitat management. It is pleasing to see that introductions are effectively discouraged.

There follows the main part of the work, which is the presentation of maps with accompanying text, depicting the distributions of fifty species for the period 1975 to 1984. Two major criticisms are apparent here, which together spoil the scientific usefulness of the book. First, the maps display no data obtained prior to 1975, the reader being referred to Heath, Pollard and Thomas (1984) for information on past distributions, and second, the grid squares on the map are not numbered making any comparison with the other work quite impossible to anyone who is not totally intimate with the boundaries of the three counties in question. This is also rather a pity for a separate reason: The book is aimed at the general reader, and such a person is unlikely to want to spend the best part of £20 on buying a second book in order that the first may be understood. The concise but useful comments on changes in status, such as the decline of the grizzled skipper or the white-letter hairstreak cannot be followed through to the maps, and although I fully agree with plotting truly recent records rather than the usual 'post-1960' dots, it would have been nice to see the inclusion of earlier records, or even a series of several maps for some of the rarer species. Nevertheless, the resultant maps of present-day distributions are highly commendable and enable the reader to know at a glance the patterns for all species in the area.

Maps for rarer migrants, vagrants and accidental species are not included, and they are probably unnecessary in any case, these species being discussed together in a separate section. The accurate and informative text provides an up-to-date account of the rich butterfly fauna of these three interesting counties, and gives full descriptions of the appearance and habits of each species. A list of nectar and larval foodplants is included and is quite comprehensive, although it makes no distinction between the two categories of plants. There is a useful bibliography.

The black-and-white illustrations which introduce each species are familiar to readers of Heath, Pollard and Thomas (1984), sharing the same artist. Indeed, ten of the fifty presented here have already been published in that work. On the whole they are good, although some are better than others. Artistic merit is, of course, all a matter of personal taste: I personally dislike the colour drawings, but others will doubtless think them very good. What is useful however, is the inclusion of colour illustrations at all, whilst still maintaining a low sales price for the book.

In spite of these criticisms this attractive little book should sell well, and is certainly to be recommended to anyone interested in butterflies in general or the home counties in particular.

Reference

HEATH, J., POLLARD, E. and THOMAS, J. A. 1984. *Atlas of Butterflies in Britain and Ireland.* Viking. London.

C. W. Plant

Banstead Woods — An Ecological Survey

by Mick Douglas and Angela M. Brunt*

Summary

Banstead Woods (Grid ref. TQ 23/35 269 590) is an area of common land of approximately 200 acres (80 hectares), administered by the Reigate and Banstead District Council. In 1983-84 investigations were carried out by the authors into the tree species present and their community structure. Surveys were also carried out on the autumn and spring ground flora and the soil types present.

Three different types of geological formation underlie the woods, namely chalk, clay-with-flints and dry-valley gravel (Fig. 1). The chalk areas of the woods were dominated by pedunculate oak and ash, with hazel and elder understorey. In disturbed chalk areas hawthorn and blackthorn were also sometimes very abundant. Autumn ground flora in these areas was dominated by bracken and bramble, whilst spring ground flora included large populations of bluebell, dog's mercury and wood anemone. Clay-with-flints areas were dominated by sessile oak/birch woodland with very little understorey. Here too, bracken and bramble dominated the autumn ground flora, but there were also some large areas of thick rhododendron scrub. Spring ground flora was less diverse, being dominated almost entirely by bluebell. The dry-valley gravel area, and some of the chalk areas, had been previously disturbed by clearance, so no definite conclusions could be drawn as to the dominant 'semi-natural' vegetation types in these areas. Despite intensive management in the past, originally as a coppice and later as scattered plantations, the woods still maintain a highly diverse floral community, with thirty different species of native trees and shrubs. Some of these, such as sessile oak, are found almost exclusively in ancient woodland, as are several of the ground flora species, such as wood anemone (Rackham 1980). These factors combine to make Banstead Woods one of the most important and interesting woods in Surrey, and as such a site of national importance from both ecological and conservation viewpoints.

History and Geology

1. Site History

The first historical reference to woodland in Banstead Parish is in the Domesday Book of 1086, where the entry records 'woodland for twenty swine'. The fact that Banstead Woods is the only substantial area of woodland recorded in the parish in later times would also suggest that this is the woodland referred to. In 1299 an area named Banstead Park was included in a grant of land made to Margaret of France (*Victoria History of the Counties of England. Surrey,* vol. 2). There can be little doubt that this is in the same place as the modern Banstead Woods, for the woods are called Banstead Park in the 1756 Rocques map of Surrey, while to this day the area on the opposite side of the B2219 from Banstead Woods is called Park Downs (Fig. 1). The existence of woodland at the turn of the 13th century is confirmed by a 1305 action for trespass in the park. The jurors stated that 'this wood would be worth 25s. were it not for the wild beasts', and that 'the underwood could not be extended because of the aforesaid wild beasts'. It is very likely that the grazing of these 'wild beasts' was also responsible for the low pannage value in the Domesday Book. To remedy this situation, the park was enclosed with 'palings [a coppice product] and hedge in 1439 *(Victoria History of the Counties of England. Surrey*, vol. 2).

The first historical reference to actual timber production on the site was in 1348-49, when Queen Philippa authorized timber from the park to be used to aid the Clerk of the Great Wardrobe in London (*Victoria History of the Counties of England. Surrey,* vol. 3). From this time on, there are many references to coppice and timber production at the site. As it was the only large wood in the area, it is highly likely that it was used for timber production in earlier times, as well as for firewood collection, and possibly the provision of building materials. For most of

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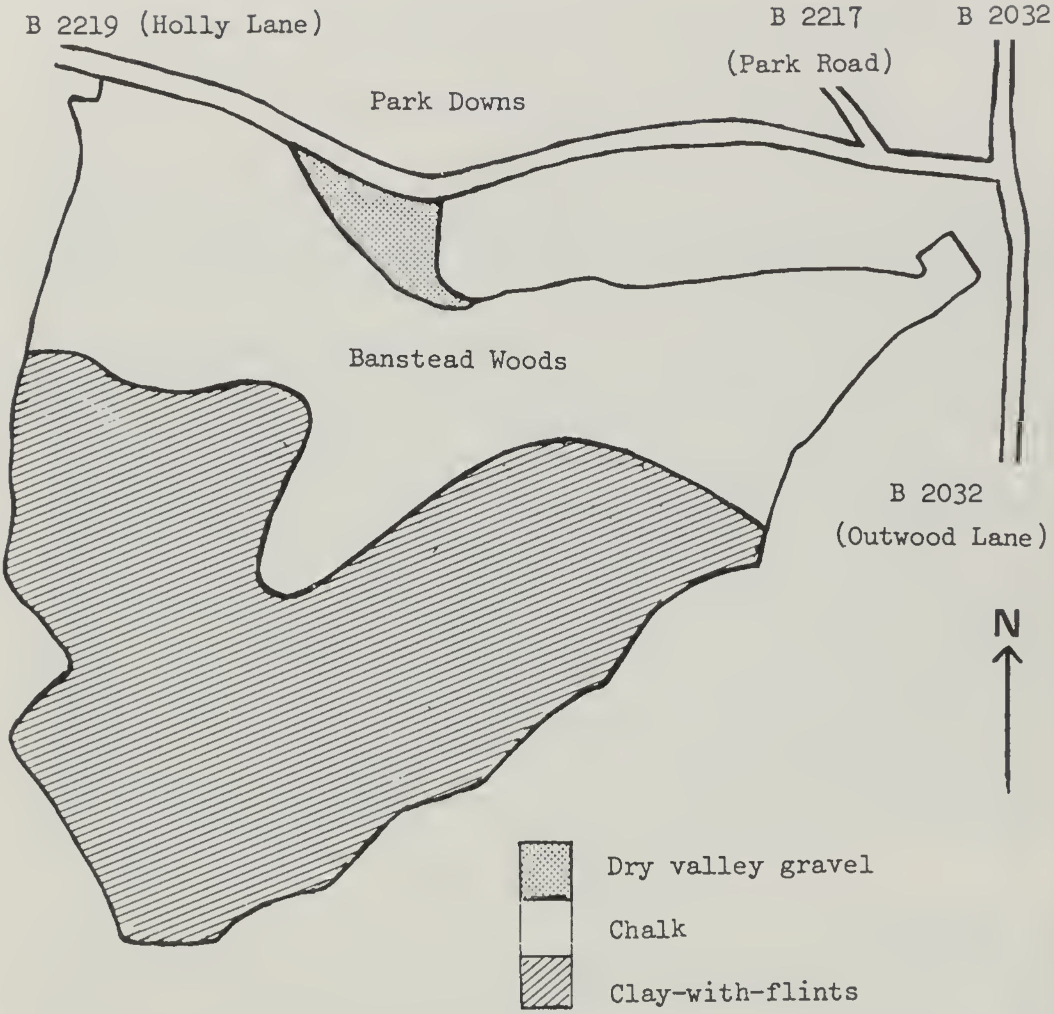

FIG. 1. Map illustrating the geology and location of Banstead Woods, Surrey.

its 'working life', Banstead Woods appears to have been operated as a hazel/ash/oak coppice with standards. However, at the end of the 19th Century there was a significant alteration in management techniques, when 100 acres (40 hectares) of spruce and birch plantation were laid out. Plantation work was also carried out in 1947, when 10,000 beech saplings were planted in an attempt to make the woods more commercially viable. This policy was, however, later discontinued, because rabbits and squirrels killed nearly all the saplings (personal interview with Denis Keenan of Reigate and Banstead Council Parks Dept.).

2. Geology and Soil Types

Of the three distinct geological formations underlying the site, clay-with-flints occurs mainly on the high ground (Fig. 1), dry-valley gravel exists principally in the north-east corner of the site, and elsewhere the low lying areas are based on chalk. Investigations were carried out to determine the pH throughout the woods, with samples being taken from both the topsoil (5 cm) and subsoil (20 cm) at each site. The pH readings were found to vary from 3.75 (highly acidic) to 7.8 (mildly alkaline). Values of 7.0 and over were found exclusively on chalk, and values below 4.5 exclusively on non-chalky soils. In some places the pH difference between topsoil and subsoil was as great as 3.0. Such striking differences are probably explained either by the presence of thin layers of clay-with-flints overlying chalk, or by the production of humic acids from dead vegetation (such as bracken) close to the surface of chalky soil.

Methods Used in Tree and Ground Flora Survey

1. Introduction

To give an accurate representation of the flora throughout the woods it was decided to take samples from plots totalling 5% of the whole area. Each sample plot was 30 metres square and was chosen by random number techniques. The same sampling plots (sites) were used for both tree and ground-flora surveys.

2. Tree Survey

To give an accurate representation of tree community structure, the trees at each site were divided into the following categories:

i. **Sapling Layer:** saplings of all tree and shrub species up to 1.5 m in height.
ii. **Shrub Layer:** young trees of canopy species from 1.5 m to 4 m in height, and shrub species of all ages other than saplings.
iii. **Canopy Layer:** mature, old, dead and coppiced species.

To reduce the volume of figures, the fifty sites actually surveyed were grouped into eleven areas of approximately similar size (Fig. 2). The survey excluded Queen Elizabeth Hospital ornamental garden and a nursery (Fig. 2).

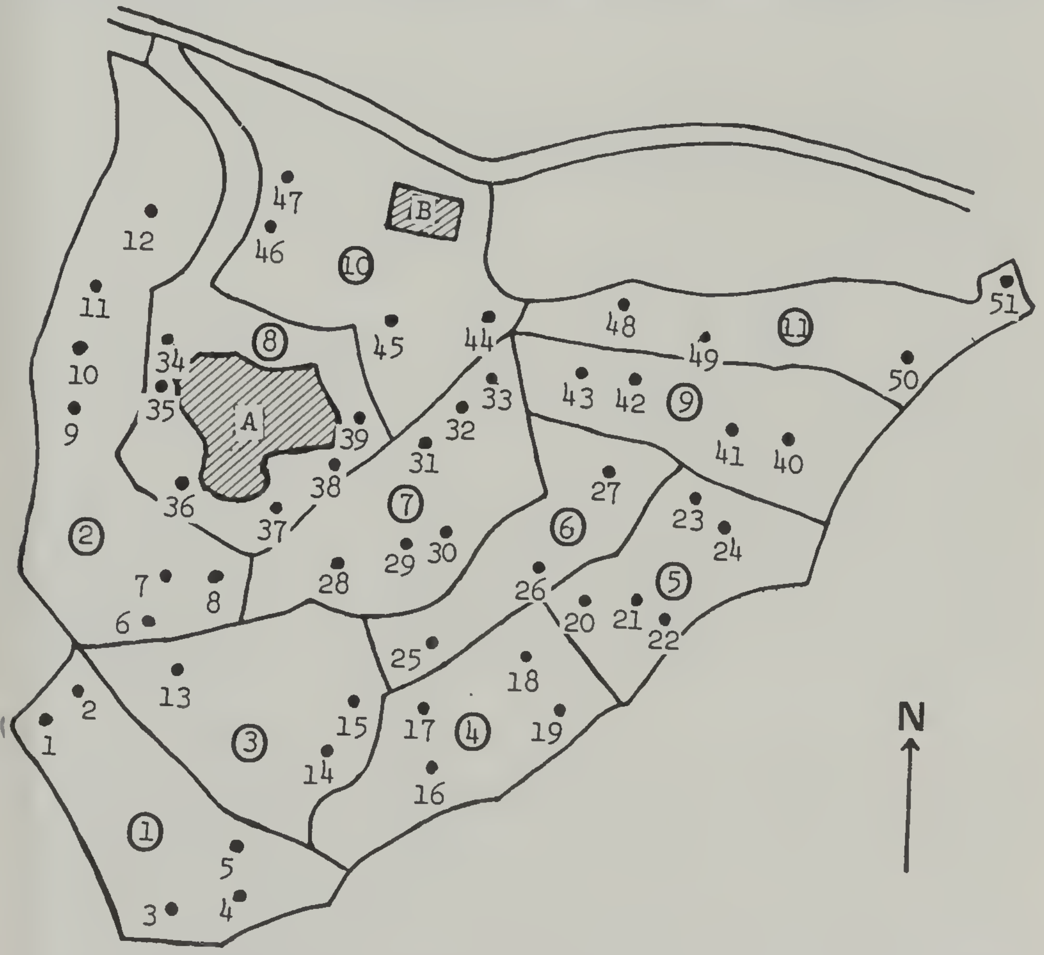

FIG. 2. Location of sampling sites for tree and ground flora surveys. Areas excluded from survey: A – Queen Elizabeth Hospital, B – Nursery area.

① – ⑪ = Areas, 1-51 = Sites.

3. Ground Flora Survey

This survey was carried out in two stages, one in autumn (Sept./Oct. 1983) and one in spring (April/May 1984). For each site the occurrence of each species was recorded as an approximate percentage cover of that site. Rhododendron, though technically a shrub species, was included in this part of the survey since its dense evergreen canopy obliterates any ground flora beneath it, and the impact of this species is more easy to assess by determining percentage cover than by counting individual bushes.

Tree and Shrub Results

Trees and shrubs growing in more or less 'natural' situations such as Banstead Woods are not distributed in a totally random manner. Instead, there are definite communities, or Stand Types, which may be identified. Peterken (1981) has identified a number of such Stand Types, and his classification, which appears to fit the tree communities found in Banstead Woods well, has been followed here. Tree Community Structure results are shown in Table 1.

1. Birch/Oak Woodland (Stand Types 6C and 6D. Peterken 1981)

The survey shows that the tree community was dominated by birch/oak woodland. Oak was particularly dominant in the canopy, whereas birch was present in large numbers in all three vegetational layers. The relative scarcity of young and sapling oaks by comparison with older trees would appear to be quite normal, as it only requires one tree per acre to reach the canopy every twenty-five years or so to maintain dominance (Cousens 1974). Together oak and birch never formed less than 40% of the canopy in any Area. They were particularly prevalent in Areas 1, 3, 5, 6, 7 and 9 (over 80%) with an average occurrence of 77% over the whole of the woods. Two species each of oak and birch were found in the survey: sessile oak *Quercus petraea* (Stand Type 6C) and pedunculate oak *Q. robur* (Stand Type 6D); silver birch *Betula pendula* and downy birch *B. pubescens*. The two oak species and the two birch species hybridise together, and the identification of some individuals was difficult. Sessile oak was found primarily in the clay-with-flints regions (Areas 1-9), whereas pedunculate oak was found with birch only in a few stands, these being mainly on chalk (Areas 7, 9, 10 and 11), or where the clay-with-flints layer was thin (Areas 1-4). Pedunculate oak was more commonly found in association with ash and hazel (Stand Types 2 and 3). The presence of sessile oak in the woods is of great interest as the species is a strong indicator of ancient woodland (Rackham 1980), and such large populations are uncommon, particularly in the south of Britain. The regions in which sessile oak was found were characterised by low shrub populations and low ground flora diversity. Most of the individual trees were either standards or long rotation coppice stools (originally cut on a sixty-year rotation). There was, however, one region of stub oak coppice, on the boundaries of Areas 4, 5 and 6. These stools were originally cut on a fourteen to twenty-year rotation, and were allowed to grow with trunks up to one metre in height, whereas long rotation stools were cut at ground level. Silver birch was the more abundant of the two birch species on all but one of the Sites surveyed. It was most common where the oak canopy was least dense, and only in Areas 7 and 11 did it exceed 30% of the canopy; but the sapling and shrub layer populations of this species were sometimes massive (86% and 70% respectively in the shrub layer of Areas 4 and 6). This illustrates the well-known ability of this species to colonise cleared regions, and also regions of degenerating uncut hazel coppice. Downy birch, like sessile oak, has strong associations with ancient woodland (Rackham 1980). The presence of this species in the canopy layer was small and irregular, but it was widely distributed. Large numbers of saplings were found in Areas 1-6, where the canopy was dense, illustrating the fact that this species has greater tolerance of shade than silver birch, which it may eventually replace in these Areas.

2. Ash/Maple Woodland (Stand Type 3C. Peterken 1981)

This was the commonest Stand Type on most of the chalk-based soils, but did not occur elsewhere. It was commonest in Areas 7, 8 and 10 and the undisturbed parts of Area 11. Principal species were hazel *Corylus avellana,* pedunculate oak, ash *Fraxinus excelsior* and field maple *Acer campestre,* while sessile oak was rare or absent. Over most of this Stand Type, oak and ash were found as standards. There were, however, one or two scattered oak stools, and in Area 11 there were a number of ash stools, some of which were evidently very old. This region of ash coppice was apparently once much more extensive, for a number of overshadowed stools, now dead, were found beneath beech and Norway maple plantations which were primarily found in this Area. This Stand Type was the only one in which field maple was found, usually in association with hazel. As with ash, there was an area of field maple coppice in Area 11. Field maple is another species with a high affinity for ancient woodland (Rackham 1980), and in Banstead Woods appears to be confined to chalk soils, though elsewhere, such as Alice Holt Forest in Hampshire, it grows on heavy clay soils (Douglas 1984, unpublished).

Hazel was the most abundant species in this Stand Type, existing mainly as uncut coppice stools. These were originally cut on a seven year rotation (*Victoria History of the Counties of England, Surrey,* vol. 3). In some Areas, e.g. 11, it was found with oak and ash standards, although in other Areas, e.g. 7 and 8, it formed its own canopy. It was beneath the areas of hazel coppice that the most diverse ground flora populations were found. Wood anemone *Anemone nemorosa* was particularly abundant under hazel.

3. Oak/Ash/Hazel Woodland (Stand Types 2A and 2D. Peterken 1981)

These two Stand Types were found on the boundaries of Areas 1, 2 and 3. The soil here was much more acid than that associated with the previous Stand Type. Field maple was absent and, except in Area 3, hazel and ash were much less numerous. Stands of both sessile and pedunculate oak were found, but the former was more abundant. Because of the higher acidity, or the sparser shrub layer, the ground flora here was far less diverse than in Stand Type 3C (Peterken 1981).

4. Sessile Oak/Lime Woodland (Stand Type 5B. Peterken 1981)

Two types of lime were found in the woods, the large-leaved lime *Tilia platyphyllos,* which is a native tree, and the common lime *T.* × *europaea,* which is a sterile hybrid between the broad-leaved lime and the other native lime species, the small-leaved lime *T. cordata.* The common lime was found only as a line of pollards on the border of Areas 10 and 11. The large-leaved lime was found only in Area 2, and some, if not all, of these appear to be planted ones as they were found in lines. There were, however, a number of saplings of this species, indicating its ability to regenerate in the conditions present in the woods. Whether this species and the small-leaved lime were originally present is not known, but this would seem likely as the large-leaved species appears to be thriving. The small-leaved lime would therefore appear to be a prime candidate for any possible reintroductions to the woods.

5. Beech Woodland (Stand Types 8C and 8D. Peterken 1981)

Beech *Fagus sylvestris* was widespread and common throughout the woods, and associated with both pedunculate and sessile oak. Many of the beech trees found in the woods were evidently planted for ornamental or timber purposes and many specimens were planted in lines. This species, however, is almost certainly native to the woods, a view supported by its high regenerative capacity. Beech and gean, or wild cherry *Prunus avium,* with which it is often found in association, appear to be able to grow taller than other species in the woods, several metres taller than either oak or ash. In Area 2 there are many old beech and gean trees which, besides being very tall, also have massive crowns. The many young beeches in Area 11 are mainly remnants of the 1947 afforestation attempt.

6. Hornbeam Woodland (Stand Type 9A. Peterken 1981)

Hornbeam *Carpinus betulus* was an important minor species, found in the woods as scattered individuals or stands. There was also a region of old coppice in Area 11, in which some of the stools are very old. The ability of this species to regenerate well is seen by the large numbers of saplings in Areas 4, 5 and 6, indicating that this species is also probably native to the woods. It was found, at different places, in association with both sessile and pedunculate oak. Generally, this species is said to prefer acid soils, and so its presence in Area 11 surrounded by ash/hazel woodland probably indicates an outcrop of dry-valley-gravel in an otherwise chalk-dominated region.

7. Associated Canopy Species

There were quite a number of rarer canopy species present in the woods. Two species of elm were found, wych elm *Ulmus glabra* and English elm *U. procera*. These elms, located in Areas 8 and 11, may represent small relict areas of ash/elm woodland (Stand Type 1A). There were two specimens of wych elm in Area 8 which, unlike the English elms in Area 11, were as yet unaffected by Dutch elm disease. Wych elm therefore survives in the woods as small, but mature, trees, whereas English elm at present survives only as suckers. Crab apple *Malus sylvestris* was found in several places in the woods, in Stand Types 6D and 3B. Found mainly in coppiced regions, this species has a high associated flora and fauna (Roper 1980), and its presence considerably enhances the diversity within the woods. Aspen *Populus tremula* was found at only one site in the survey, though other individuals were seen in sites not surveyed in detail, mainly in Area 1. Goat willow *Salix caprea* is a little-studied species also found in the woods, which occurs as a small tree or bush. Distribution was quite widespread, but it was commonest in Areas 7 and 8. This species is also common on nearby areas of chalk grassland, where it is highly invasive. Yew *Taxus baccata* was most commonly found along the eastern boundary of the woods, where it was probably planted as a hedge. There were, however, a number of mature individuals and saplings found in the woods, principally in Stand Type 6C. Holly *Ilex aquifolium* was locally abundant within the woods, particularly at Sites 12, 14, 21, 25 and 48, where it formed regions of dense scrub. This species was found most commonly in association with sessile oak. There were a number of locally abundant non-native species within the woods. These include sycamore *Acer pseudoplatanus*, sweet chestnut *Castanea sativa*. horse chestnut *Aesculus hippocastanum* and larch *Larix europaea*.

8. Shrubs

The shrub species distribution within Banstead Woods is very important as shrubs can be used to indicate a number of historical and ecological conditions. Spindle *Euonymus europaeus* and wood hawthorn *Crataegus oxyacanthoides* are both important in this respect as they both have a high affinity for ancient woodland (Rackham 1980). Both species have a restricted range within the woods and exist mainly in Areas 7, 8, 10 and 11, primarily in hazel coppice. Both species are shade tolerant (Cousens 1974), as well as being calcicolous, as also is common hawthorn *C. monogyna*. These species are also indicators of fertile soil conditions within the woods. Common hawthorn is however shade intolerant (Cousens 1974) and therefore has a somewhat different distribution to the other two species. It is, in fact, most common in areas of open canopy or where clearing has recently occurred (i.e. Area 11). Elder *Sambucus nigra* and purging buckthorn *Rhamnus catharticus* are species indicating soils rich in phosphate (Rackham 1980). Purging buckthorn is shade intolerant whereas elder is shade tolerant. Purging buckthorn was found only in Areas 7 and 11, principally on sites 38 and 48, where there were many saplings indicating expanding populations. Elder was more widely distributed, being found in all areas except 4-6, and was, besides hazel, the principal shrub species. Dogwood *Cornus sanguinea*, wayfaring tree *Viburnum lantana*, privet *Ligustrum ovalifolium*, box *Buxus sempervirens* and whitebeam *Sorbus aria* were calcicolous species found at one Site only.

Ground Flora Results

1. Autumn Ground Flora 1983

Autumn ground flora results are shown in Table 2. Throughout Banstead Woods, the autumn ground flora was characterised by general low diversity. By far the commonest components of the ground flora were rhododendron *Rhododendron ponticum,* bramble *Rubus fruticosus* and bracken *Pteris aquilina,* which between them make up nearly 80% of the ground cover. Rhododendron is restricted in its range as it is unable to grow on chalk (Tivy 1981), but in parts of the clay-with-flints region of the Woods forms up to 90% of the ground cover. Bracken also tends to grow on acid soils and is particularly common in parts of Areas 1, 2, 6 and 10. Here bracken glades exist, which may even have existed for hundreds of years (Rackham 1980). Over most of the Woods bracken is associated with bramble. Bramble was common in some parts of all Areas surveyed, except Areas 10 and 11, but it was generally most abundant in the northern section of the Woods. Which of the two species dominates probably depends usually on the acidity of the topsoil, as bracken prefers acid soils, whereas bramble grows best on neutral soils (Rackham 1980). Small numbers of dog's mercury *Mercurialis perennis* were still found at this time of the year, indeed, like bramble, it is able to maintain a number of leaves over winter. Stinging nettle *Urtica dioica* and rosebay willowherb *Epilobium angustifolium* are both calcicolous species, and were found in greatest densities in Areas 7 to 11. Occasional occurrences elsewhere in the Woods are probably explained by chalk being near to the surface of the clay-with-flints. Grass species were found mainly on and around footpaths, and were not studied at any depth in this survey. A further examination may reveal many interesting species, as Banstead Woods is so old, and some of the paths in it are likely to have been in use for many centuries.

2. Spring Ground Flora Results 1984

Spring ground flora results are shown in Table 3. The major differences between spring and autumn ground flora are:

i. The greater diversity of the spring ground flora.

ii. The presence of massive numbers of bluebells *Hyacynthoides non-scriptus* throughout the woods, and also large populations of dog's mercury *Mercurialis perennis* and wood anemone *Anemone nemorosa* in the spring.

Due to its evergreen habit, rhododendron cover is the same as in autumn. The lower percentage of bracken and bramble cover is attributable to leaf loss. Bramble has fewer leaves and bracken is represented by a mass of dead fronds. Bluebell was the commonest component of the spring ground flora in the woods, being most abundant in Areas 1 to 7, and 9. Dog's mercury is common in the low-lying parts of the woods, principally in Areas 7 to 10, and 11. This species is shade-loving (Packham and Harding 1982), and is one of the few species whose numbers would probably be reduced by coppicing. The presence of dog's mercury is indicative of high soil nutrient status and it prefers a low-lying calcareous soil of low gradient (Packham and Harding 1982). This species is local in its British distribution, tends to be somewhat monocultural in habit and is a stress-tolerant competitor (Packham and Harding 1982). Distribution in Areas other than those mentioned above was confined to paths and wood edge. Dog's mercury is a variable indicator of ancient woodland (Rackham 1980).

Certain ground flora species found in Banstead Woods are almost confined to ancient woodlands, only rarely spreading to secondary woodlands and hedgerows, and then only when adjacent. Violet *Viola canina* and primrose *Primula vulgaris* are both calcicolous and this may be why at Banstead Woods they were only found in Areas 7-11. Primrose was widespread here, but generally was only found at low densities. Violet, on the other hand, which was also locally widespread, was more normally found in clumps. Another reason for the limited occurrence of these species within the woods could well be the type of management in the past. Sherriffs (1985) found that wood anemone *Anemone nemorosa* distribution was dictated more by a preference for sites managed as coppice rather than soil type. Wood anemone distribution in Banstead Woods seemed to follow this pattern, as it was found almost exclusively beneath areas of hazel coppice in the Areas in which it was found (7-11), being particularly prevalent at site 30 (Area 7), where hazel was the dominant tree species. It must be mentioned here that although wood anemone is considered an ancient woodland indicator species in south-east England (Rackham 1980), in other parts of the country it is found in more open conditions, such as moorland (Sherriffs 1985).

Certain other species whose affinity for ancient woodland is not known were found in the woods. Wood sorrel *Oxalis acetosella* was widely distributed throughout the woods though at low densities. This species was hard to locate owing to its small size and so its distribution among bramble may be greater than recorded. Clematis *Clematis vitalba* and bugle *Ajuga reptans* are two calcicoles also found within the wood with a restricted range. Bugle was found only at one site in the survey.

General Discussion

Geology and management appear to be the major controlling factors in the distribution of the floral communities of Banstead Woods. Geology is important because it affects soil types and thus to some extent what is and is not able to grow in a certain area. In Banstead Woods two, possibly three, basic types of tree community are found whose ranges appear to be dictated primarily by geology. Thus the chalk region is dominated by pedunculate oak, ash and hazel, the clay-with-flints region by sessile oak and birch, and, from the evidence available, hornbeam appears to have been a major species in at least part of the dry-valley gravel region. Whether the distribution of other common species such as beech and cherry are also affected by slight variations in geology and soil type is not known.

Investigations into the history of Banstead Woods reveal that the site has been intensively managed for hundreds, possibly thousands, of years. When managing a site such as this people tend, consciously or unconsciously, to exert a degree of selective pressure. Thus there is a tendency to select trees with certain timber or aesthetic qualities, and this may well prove detrimental to other less 'valuable' species. Nevertheless, the woods do seem to have retained many semi-natural characteristics, in both the tree and ground flora communities. The retention of these features seems attributable largely to the method of coppice management previously used extensively throughout the woods.

Coppicing is a totally different method of management from the other commercial forestry methods and practices used in the more recent past, in fact; (1) natural regeneration has normally been the method of stool replacement (Rackham 1980), allowing a fairly natural distribution of individual trees; (2) it is not monocultural. A hazel coppice, for example, has a wide variety of other species growing in it, either as coppiced or standard trees; and (3) the natural ground flora is retained, and may even be enhanced.

By contrast, the more recent management methods in this wood have been more detrimental to its community structure. These occurred in two principal phases, about 1900 and about 1947. Around the end of the last century coppicing in Britain began to decline seriously (Rackham 1976) because of increased labour costs and the cheapness of imported timber. As a result of this many woodland managers looked for alternative methods of production. As conifers were fast growing and in demand these were the main species selected. About 100 acres (40 hectares) of conifers and birch were planted in Banstead Woods at this time (*Victoria County History of the Counties of England. Surrey,* vol. 2). Nevertheless, many coppice owners were convinced that this decline in their own system of management was only a 'trend', and that coppice products would soon come into demand again (Rackham 1980). Perhaps for this reason, although the conifers were probably planted densely in some places – as in Area 8 – in most places they were interplanted with trees already present to allow coppice production to continue as well. In the intervening period between that date and the present time many of the conifer trees have been removed for timber and the number present today is relatively low. The second period of afforestation, about 1947, appears to have been more destructive. It seems that large parts of Area X were clean felled, although not grubbed up. As a result of the felling, hazel is absent from much of the Area, and scattered dead ash coppice stools remain as a remainder of the destruction. The trees planted at the time were all beech, but, as mentioned above, they were mostly destroyed by rabbits and squirrels. In the few patches where they survive (Area 11) there are some very dense stands of young beech. In some parts of the Woods where beech failed, Norway maple was then planted and coppiced; while in other parts, the region was just left and not replanted. In places such as these, buckthorn and hazel are particularly abundant today. The plantation attempts, though initially disruptive, do not appear to have caused too great an effect on the tree community as a whole, but they were devastating in the ash/hazel coppice regions. Apart from eight or ten acres however, most of the disturbed parts are reverting to woodland once more.

The interaction of geology and management has had a beneficial effect on the ground flora, making it the rich and diverse community present in many parts of Banstead Woods today. Because the Woods are of limited area, the nature of the management practices followed is very important for the overall diversity and richness of species. When coppicing was discontinued this seems to have led to a reduction in diversity, particularly of the ground flora.

Conclusions

The survey shows that Banstead Woods is an ancient woodland, most of which still retains a largely natural structure. Such sites have declined throughout Britain by 50% since 1945 (Roper 1981). Perhaps surprisingly, a large proportion of those remaining are located in S.E. England (Peterken 1981: 40). Banstead Woods is one of the largest remaining complete semi-natural woods left in Surrey, making it a very important site. Furthermore, following the results of this survey, it appears that Banstead Woods fits all of the ten criteria set out by the Nature Conservancy Council for sites deserving S.S.S.I. (Site of Special Scientific Interest) status (Peterken 1981: 241). It would therefore seem that the status of this site needs urgent review. For these reasons it is also essential that an in-depth examination of the future of the Woods should be carried out by the Reigate and Banstead District Council. Banstead Woods badly needs a long-term written management plan, which must be implemented before rhododendron invasion and the cessation of coppicing destroys more of its natural structure. The principle aim of a management plan for Banstead Woods should be to create as natural and balanced an ecosystem as possible between the plants and animals within the Woods. To achieve this aim, the plan should incorporate both long- and short-term objectives. The short-term objectives should be designed to prevent deterioration in the present diversity of the Woods. The long-term objectives should be designed to increase the present diversity of the Woods.

The short-term objectives suggested are:

i. The control of 'weed' species, particularly rhododendron.
ii. A small-scale re-introduction of coppicing, if possible on all three soil types present within the Woods.
iii. Allowing at least 50% of the Woods to develop towards high forest.

The construction of new paths where necessary, particularly in connection with **ii**), above.

Minimum long-term objectives suggested are:

i. Either to eradicate rhododendron from the Woods entirely, or at least to confine it within maintainable regions.
ii. Following short-term objective **ii,** to expand the coppice area to cover up to 50% of the site, while still leaving at least 50% of each soil type to develop to high forest.
iii. To investigate which plant and animal species are likely to have existed in the Woods in the past. Reintroduction might follow where it seems acceptable and feasible.
iv. Insofar as this can be done without damage to the objectives stated above, to develop the recreational and educational potential of the Woods.

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TABLE 1. Tree community structure (percentage by area).

Area 1	Sapling	Shrub	Canopy	Total 1	O/D	Copp.
Sessile oak	4	23	51	30	2	24
Pedunculate oak		3	4	3		
Silver birch	8	23	21	18	1	
Downy birch	38	4	9	14	1	
Beech	21	3	5	8		
Ash	4	3	3	5		
Cherry		1	2	1		
Rowan	3			1		
Yew			1	0.5		
Sweet chestnut	3	1	5	3		2
Balsam poplar	1	5		2		
White poplar		3		1		
Sycamore	1			0.5		
Larch	1			0.5		
Elder	14	26		12		
Hazel		3		1		2
Hawthorn	3			1		
Total 2	25	32	42			
Area 2						
Sessile oak	12	12	36	22	2	11
Pedunculate oak			4	2		
Silver birch	7	20	19	17	0.5	
Downy birch	19	13	5	11	0.5	
Holly	11	5	5	7		
Beech	3	2	11	6	1.5	
L. l. lime	2	1	5	3		
Cherry	2	2	5	3	1	
Ash		1		0.4		
Sycamore	13	10	1	8	0.5	
Sweet chestnut	1	1	2	1		
Horse chestnut	1		3	1		
Spruce			4	1		
Larch			0.5	0.2		
Elder	23	23		14		
Hawthorn	4	1		2		
Hazel		4		1	1.5	
Wood hawthorn		2		0.5		
Goat willow		0.5		0.2		
Spindle		0.5		0.2		
Total 2	22	39	40			
Area 3						
Sessile oak	17	22	66	54	4	25
Pedunculate oak			2	1		
Silver birch	25	18	27	26	2	
Downy birch		1		0.5		
Beech	8	23	1	3		
Aspen			1	0.5		
Cherry	8			0.5		
Sweet chestnut	8	8	8	3		1
Sycamore	17	3		2		
Fir		3		1		
Hazel		17		6		15
Hawthorn	8	5		2		
Elder	8			0.5		
Total 2	7	24	69			

TABLE 1. Continued.

Area 4	Sapling	Shrub	Canopy	Total 1	O/D	Copp.
Sessile oak		5	49	29		
Pedunculate oak			4	2		
Silver birch	41	81	26	43		
Downy birch	18			3		
Beech	9		6	5		
Yew	13		3	4		
Hornbeam	13		2	4		
Scots pine			3	2		
Cherry			2	1	1	
Sweet chestnut	5	5	6	5	1	
Spruce			1	1		
Hawthorn		5		2		
Spindle		3		1		
Total 2	17	28	54			
Area 5						
Sessile oak		35	59	41	3	26
Silver birch	5	20	24	20	2	
Downy birch	12	27	12	17	0.6	
Beech	36	1		7		
Holly	21	2	0.5	4		
Rowan	7	3	1	3		
Cherry	5	4	1	3	0.3	
Hornbeam	11	2		2		
Crab apple			2	2	0.3	
Yew	2			0.3		
Horse chestnut		1		0.3		
Sycamore	1			0.3		
Hazel		3		1		
Hawthorn		2		0.5		
Goat willow		1		0.5		
Total 2	17	31	52			
Area 6						
Sessile oak	24	8	68	37	2	38
Silver birch	14	66	27	30	3	
Downy birch	12	6	2	7		
Beech	19	9	2	10	0.3	
Hornbeam	21		2	9		
Holly	6			2		
Rowan	4			1.5		
Cherry	1	2		1		
Yew	1			0.5		
Cotoneaster		6		2		
Hazel		3		1		
Total 2	41	22		37		
Area 7						
Sessile oak	1	6	21	10	0.5	14
Pedunculate oak	6	1	6	5		
Silver birch	12	24	52	33	1.5	
Downy birch		4	2	3	0.5	
Cherry	47	14	5	15		
Field maple	7	7	1	2		
Ash		3	1	1		
Beech		1	2	1		
Crab apple		2	2	1		
Holly	2			0.3		
Hornbeam			0.5	0.3		

TABLE 1. Continued.

Area 7 cont.	Sapling	Shrub	Canopy	Total 1	O/D	Copp.
Norway maple		2		1		
Sweet chestnut			1	0.5		
Spruce			6	6		
Hazel	9	27		15	1	21
Elder	5	9		5		
Hawthorn	5	3		2		
Wood hawthorn	3	3		2	0.2	
Goat willow		2		1		
Buckthorn		1		0.5		
Wayfaring		0.5		0.3		
Total 2	12	52	36			
Area 8						
Sessile oak	3	12	23	14	1	2
Pedunculate oak		6	3	4	1	
Silver birch	22	12	15	15	0.3	
Downy birch	9		1	4		
Beech	18	1.5	6	6	0.3	
Field maple			7	2		
Yew	2	1.5	2	2		
Rowan		1	1	1		
Ash			1	0.5		
Cherry		1		0.5		
Holly		1		0.5		
Laburnum		1		0.5		
Cypress		1.5	19	7		
Spruce			10	3		
Corsican pine		1	7	2		
Larch			4	1		
?		1		0.5		
Buckthorn	39	11		12		
Hazel		12		6		10
Elder	3	9		5		
Hawthorn		9		4		
Wood hawthorn		8		4		
Goat willow		8		4		
Box		1				
Privet		1				
Sycamore	3	1		1		
Total 2	18	52	30			
Area 9						
Sessile oak	11	10	53	29	0.5	23
Pedunculate oak	6	9	6	6		
Silver birch	12	14	26	18		
Downy birch			1	0.5		
Beech	15	17	11	14	1	
Cherry	29	10	4	11		
Holly	7			1		
Norway maple	5	7		3		
Sweet chestnut			1	0.5		1
Cypress		1		0.5		
Fir			1	0.5		
Elder	15	24		11		
Hazel		7		3		1
Goat willow		1		0.5		
Total 2	18	37	44			

TABLE 1. Continued.

Area 10 cont.	Sapling	Shrub	Canopy	Total 1	O/D	Copp.
Ash	19	21	10	19	1	1
Pedunculate oak	3	5	36	10	0.2	
Beech	3	4	17	6	1	
Silver birch	1	3	17	5	0.2	
Downy birch		6	2	4		
Holly	16	0.5	1	4		
Cherry		3	1	2		
Yew	4	1	4	2		
Common lime			1	0.5		
Wych elm	1		1	0.5		
Hornbeam			1	0.3		
Whitebeam			1	0.3		
Sycamore	12	9		8		
Horse chestnut		1	4	1		
Sweet chestnut		0.5	1	0.5		
Norway maple		1		0.3		
Larch			1	0.3		
Spruce			1	0.3		
Corsican pine			1	0.3		
Elder	24	18		16		
Hawthorn	14	8		7		
Hazel	2	8		5		5
Spindle		8		5		
Buckthorn		2		1		
Wood hawthorn		0.5		0.3		
Total 2						

Area 11						
Beech	7	14	4	10		
Silver birch	4	2	45	8		
Cherry	14	2	4	6		
Ash	2	1	23	4		
Pedunculate oak	2	0.5	15	3		2
Field maple	2	0.5	2	1		
Yew		1	6	1		
English elm		0.5	2	0.5		
Hornbeam			1	0.5		
Norway maple	8	2		4		7
Sycamore	2		5	1		5
Horse chestnut	1			0.3		
Fir		1	6	1		
Hawthorn	20	35		26	1	
Buckthorn	31	12		16		
Hazel	7	17		9		14
Elder	7	11		7	0.5	
Spindle		1		0.5		
Dogwood		0.5		0.3		
Total 2	32	55		13		

TABLE 2. Ground flora percentage cover in autumn.

	Site numbers																																																		
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
1 Bare Ground				25	15	15						30	10	10		10	10	10	30		5	5	10	3	20				10	10	20						20	30	18		10	5	20		40	30	30		10	30	
2 Bracken	80	90	20	25	59	15	20	10	60	60	20	25	15	40	40		40	25	40	50	10	5	5	40	60	40	20	80	50	40	15	15	20	50	25	20	5		15	20		10	30	50	30				10		
3 Brambles			80	25	40	10	20	10	30	40	80	30	60	50	20		20	45	30	50	85	90	85	57	20	40	80	5	40	50	15	30	20		5	40	15		30	80	80	85	40				5	10	55	20	5
4 Comfrey																																																10			
5 Dog's mercury									10																						30	25	20						2		5				15		15	5			
6 Ground ivy																																																			3
7 Garlic mustard																																																			12
8 Grass	20	10		25																						20																			5		15				35
9 Ivy																																																			15
10 Nettle																																	20				20	40	15							10	15	55	15		30
11 Rhododendron					40	60	60	80					15		40	90	30	20										15						20	70	40								50	10	40	20				
12 Willowherb												15																			20	30	20				40	30	20		5		10			20		20	10		
13 Other																																		30																	

TABLE 3. Ground flora percentage cover in spring.

	Site numbers																																																		
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
1 Bare ground		10		4	26							20		10		2		10			15	10	20	15	30	9					15			40			10		10	30	5	20			10		10		10	40	20
2 Bluebell	80	40	30	25	40	20	5	7	10	38	20	50	35	30	30	4	40	30	40	20		40	20	15	15		10	55	32		20	60	50		3	30	50	10	10	50	30		15	40				10	49		
3 Bracken	5	5				8		6	30	10	10		20		10		5							10		40	10	10	8			20	10		3	5			2												4
4 Bramble	15	40	70	30	26	8		5	40	2	70	20	30	60	20		20	39	60	60	80	30	60	60	30	50	40	20	15	15	4	20	40		9	20	8		6	15	50	80	75						25	5	
5 Bugle																																														1					
6 Clematis																					5																				5										
7 Comfrey				1																																												1			
8 Daffodil		1																																			8														
9 Dandelion																																																1			
10 Dock																				3					5																						5		2		4
11 Dog's mercury							1			38										5									15	67	35			2			10	68	70					10	70	50	20	30	4	50	
12 Dog rose																																																			5
13 Forget-me-not																																															10		1		
14 Foxglove																																															2	10			2
15 Garlic mustard																				3																	1														
16 Goat's rue																																																			
17 Ground ivy																																								1											8
18 Grass							3										5					20			10		40								15												10				20

	Site numbers																																																		
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
19 Goosegrass																													1																						4
20 Herb Robert																																																			5
21 Holly												10																																							
22 Horehound																																								2									1		4
23 Ivy																																																			6
24 Lords and ladies										2																				5								2							2		5	4		3	8
25 Lesser celandine																														2	1							3									5				5
26 Moschatel																															1																				
27 Moss sp.																																		28				8										2			
28 Nettle						4			5																10				2		8						8	2			5					7	10	29	3		5
29 Primrose							1																								1							2							2		3	2			
30 Raspberry																															2						4								4						
31 Rhododendron				40	8	60	90	80					15		40	90	30	20										15						30	70	40								50	10	40	20				
32 Saxifrage																																																	1		
33 Speedwell																																																	1		
34 Willowherb		4							15	10										4									2		8					5				2	2		5			2		10	3	2	
35 Wood anemone																		1											25	10	3							4	2		1							1			
36 Wood sorrel								2												5						1					2										2		5								
37 Wood violet																														1							1	1							2						

Book Review

A Bibliography of Irish Entomology. By J. G. Ryan, J. P. O'Connor and B. P. Beirne. The Flyleaf Press, Dublin. 1984. 363pp. £12. A limited edition of 500 numbered copies. ISBN 0 9508466 0 0.

Ireland, at least by comparison with Great Britain, is a poorly studied area of the British Isles, certainly as far as the majority of invertebrates are concerned. Whilst it is true that many 'foreign' naturalists visit that country each year, their travels are usually confined to within striking distance of such notably 'good' areas as the Burren and elsewhere, leaving the vast portion of the central area of Eire devoid of any wildlife records. Consequently, one may reasonably expect a bibliography of that country's entomology to be a slender volume. This is quite evidently not the case, for within the confines of the 363 pages here reviewed are crammed over 5000 references on this general subject. Following the introductory paragraphs we are first presented with a list of fifty publications which were consulted 'page by page' by the first two named authors, and the fruits of this labour have been combined with the earlier work by Beirne (*An Annotated and Classified Bibliography of Irish Entomology* to 1948 for Lepidoptera and to 1946 for other orders). There then follows twenty-one chapters of references, commencing with one on general works, containing references to more than one order of insects, ending with one on the subject of pest control, and with the nineteen in-between covering twenty-five orders of the Class Insecta.

The general principal, not to mention the widespread need, for a work of this nature leaves the reviewer reluctant to offer more than essential criticism. Regrettably however, there are one or two points which ought to be made. The list of fifty works consulted could have been larger. I notice that the *Proceedings of the South London Entomological and Natural History Society* were searched to 1946, and that the successor journal *Proceedings of the British Entomological and Natural History Society* were not searched at all. Absent also is *The Naturalist*, which may or may not contain Irish material, (since it was not searched we shall never know!).

A far more serious criticism however, is that the book is difficult, if not occasionally down right impossible to use, a situation resulting from the total lack of a cross-referenced index to localities, families, genera or species. This may be of less consequence if searching for Neuroptera references, where there are only nineteen cited in total, but to locate a particular moth for example, or even a group of moths, one has to first read through 142 pages of Lepidoptera references, arranged alphabetically on the authors' names, followed by 37 pages of Hymenoptera references, (for host records), then twenty-eight pages of general references and finally eighteen pages on pest control. In all, 225 pages, or approximately 3200 references! It might be quicker to refer directly to the indexes of the journals in the local museum or library. To review the entire insect fauna of one locality would involve a search of the entire volume!

The idea of a separate general section may be convenient, but serves little useful purpose. Whilst it is true that below each entry the orders mentioned are summarised, it would have been more convenient had the relevant references been repeated under each order heading. In any case, the single entry which I checked may contain an error: The 1895 paper by Halbert purports to contain references to Hemiptera, Coleoptera, Odonata, Plecoptera and Orthoptera, yet the same reference is listed as a source of data on Neuroptera by Killington (1937). Without checking the original work, I cannot say who is correct, and since the whole purpose of the bibliography is to avoid this task then clearly something is amiss.

My other main criticism is that although the literature was searched up to the end of 1980, the bibliography itself did not appear until April 1984 — some three-and-one-third years later. This seems a very long delay and renders the work instantly out of date. Since the original typescript seems to have been used as the camera ready artwork for the printer, rather than involving time consuming and expensive type-setting, I cannot see why this considerable delay should have occurred.

In spite of all this the work will find a useful place in Museums and libraries as well as other centres of learning and in personal libraries, although with only 500 copies in existence it may still be more convenient for most researchers to refer to the indexes of the journals in the library! I think that the authors would have done better had they perhaps spent a little longer on the research, thus avoiding the apologetic comments made on pages 2 and 5. This, together with the reproduction of the entries in the general references section as many times as necessary under the appropriate order headings, and the inclusion of fully cross-referenced indexes would have doubtless doubled the size of the volume. This could then have been efficiently reduced by proper type-setting of the pages, and with adequate advertising sales would doubtless have exceeded the 500 to which the present run is limited.

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C. W. PLANT

The Chinese Mitten Crab *Eriocheir sinensis* H. Milne Edwards – a Contentious Immigrant

by R. W. INGLE*

On 17 December 1936 two newspapers (Anon 1936a, 1936b) carried details about the appearance of an exotic crab in the River Thames. These accounts originated from the 1935 report (Harold 1935) of the Metropolitan Water Board which detailed the capture of a mitten crab on the intake grating of Lot's Road Generating Station at Chelsea. The specimen attracted sufficient interest for it to be exhibited at the 1935 September meeting (Anon 1935) of the Zoological Society of London by Professor R. T. Leiper F.R.S. who commented that the '...crab is a source of lungworm disease (Paragonimiasis) in Man in the Far East, but as the first intermediate host is absent in this country the recent alarmist reports of the danger of its introduction into England are unjustifiable...'. These accounts heralded the mitten crab's first reported appearance in British waters but were not the first mention by a British newspaper of this alien crustacean. In January 1934 the *Eastern Daily Press* (R.G. 1934) carried an article headed '... The Hairy-fisted Crab a New Pest to Beware of...', detailing the crab's activities in Europe, where it had spread since being introduced from the Far East, and drawing attention to its habit of undermining river banks by burrowing and the serious nuisance it caused to fishermen by damaging nets and stealing bait. The article warned that the Norfolk Broads could be at risk if mitten crabs were to arrive there. The Chelsea mitten crab remained the only British record for fourteen years until, in 1949, a letter published in the *Angler's News and Sea Fishers' Journal* (Cockerham 1949) for 29 October described a crab that had been captured in Southfields Reservoir, Yorkshire, purporting to measure 10 inches across and with '...velvet covering on the first segment of the large claws...'. This live specimen was given to the Grammar School at Castleford, from which particulars were sent to the British Museum (Natural History). The description left no doubt that this was a mitten crab, the size was reassessed as '...between 7″ and 8″ across the widest part not 10″ as stated...' (Oddy 1949) (10cm carapace width according to the Merseyside Naturalist Eric Hardy (Wall and Limbert 1983)). The crab was released into a small partly fenced-off stream but escaped and was never again seen.

A further twenty seven years were to pass before the rediscovery of mitten crabs in British waters. During 1976 three males (one fragmented and two living) were found on the cooling water intake screens of West Thurrock Generating Station, a location some 36 km below London Bridge (Ingle and Andrews 1976). In the same year mitten crabs were seen for the first time in the River Humber, Yorkshire (Clark 1984). The West Thurrock records were to provide the first of several subsequent sightings in the River Thames. To date over twenty specimens have been caught there, two carried eggs and twelve were seen alive when water in the Regent's Canal Dock was lowered (Andrews *et al.* 1982). During 1979 a female mitten crab bearing eggs was caught at Southend-on-Sea and further specimens have been reported since from the River Humber region, the last confirmed occurrence being in 1984.†

Mitten crabs belong to the crustacean family Grapsidae and to the genus *Eriocheir.* The three known species are all natives of temperate eastern Asia but only one has invaded Europe, *Eriocheir sinensis* H. Milne Edwards, 1853, and the vernacular name Chinese mitten crab is reserved for this species. In its native region the Chinese mitten crab is found from the Fukien province of China to the

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†Since this article was submitted further specimens have been caught in the Humber region (River Ouse). See *Biologist* (1986) **33**, 4: 212.

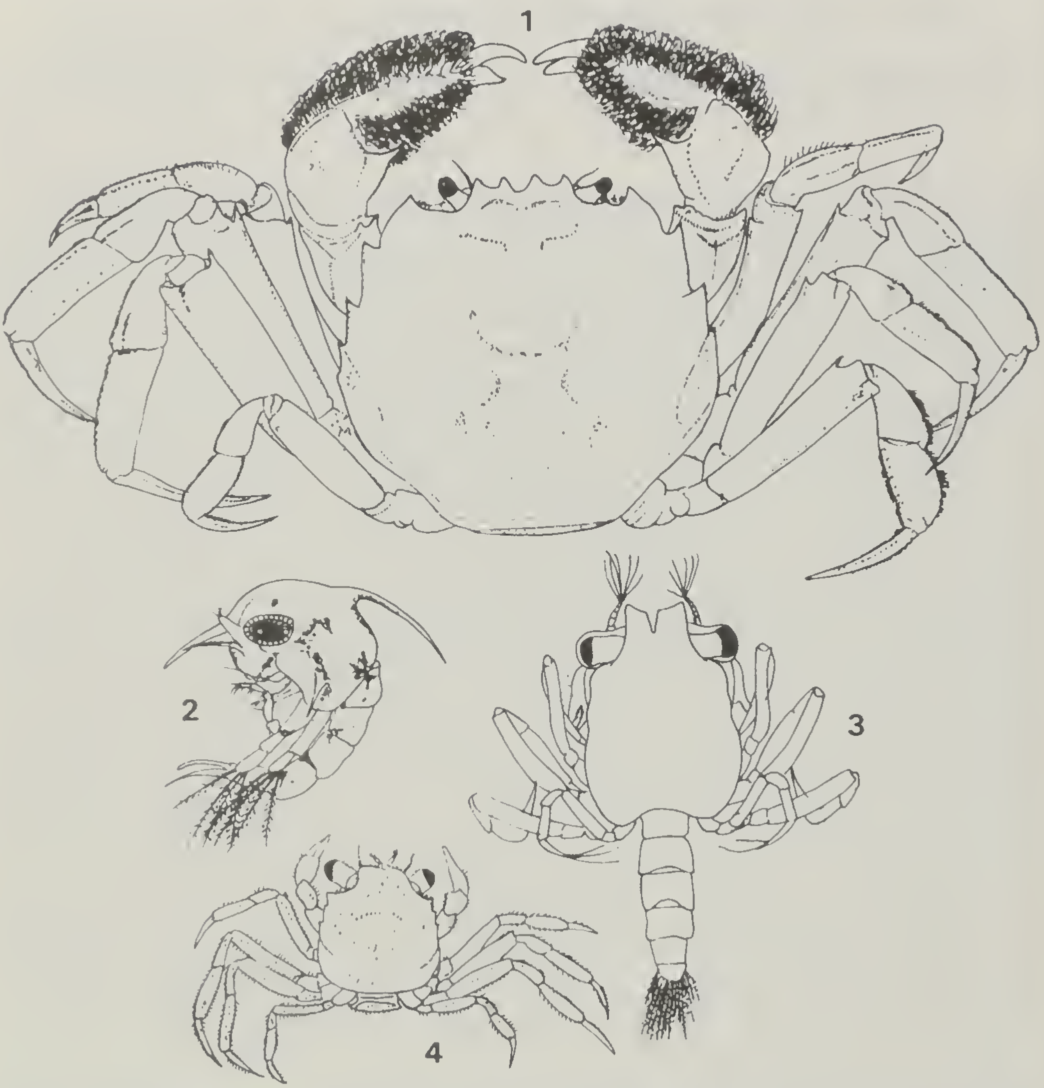

FIG. 1. *Eriocheir sinensis* H. Milne Edwards, Chinese mitten crab. 1, Adult male. 2-4, three stages in life history. 2, first of five zoeal stages; 3, megalopal stage; 4, young crab of 3mm carapace width (redrawn from André 1947).

western coast of the Korean Peninsula (Panning 1938) and often in greatest numbers in rice fields near coasts, although the crab also wanders far inland where it is usually confined to rivers. The mitten crab is recognised by its squarish body shell (or carapace), the margins of which are shaped into four teeth. A particularly distinctive feature is the covering of fur on the outer surfaces of the large claws (Fig. 1). This may be patchy in some specimens but usually forms a conspicuous furry 'mitten' on each claw, from which the crab derives its common name.

The first Chinese mitten crab discovered in Europe was a large male caught during 1912 in the River Aller, a tributary of the Weser in Germany. This could have been one of many that may have been accidentally introduced into German rivers during the first decade of this century at which time there was considerable maritime traffic in both directions between Europe and Eastern Asia. By 1915 mitten crabs had appeared at the mouth of the River Elbe. By 1926 they had reached the upper tidal regions above Hamburg and during 1927 vast numbers were present in that region. A few years later they also appeared in enormous numbers in the mid-Elbe and control measures became necessary. By 1930 they had spread into other German rivers reaching the Netherlands, Belgium and France over the next three years. They became established in the Baltic coastal regions and spread into Denmark, southeastern Sweden, Latvia and southern Finland (Haahtela 1963). The crab was reported from the Boulogne region of France (the nearest locality to the British Isles) during 1930 and again in 1936 (Hoestlandt 1959). At some time between these dates it must have arrived in the River Thames.

Coming from the temperate waters of eastern Asia the mitten crab has readily adapted to the similar temperate conditions of European rivers. Introduction into Europe may have occurred in two ways. Most likely, small crabs or larvae were swept into ballasting tanks of vessels taking on water in asiatic ports and were then discharged during de-ballasting on arrival in German ports. During a voyage some of the larvae could have passed through their metamorphosis and been released as young crabs. This hypothesis is supported by evidence of young mitten crabs being found in ballasting tanks of vessels *en route* from the Far East (Hoestlandt 1948). Transport over short distances could occur when crabs find suitable hideaways amongst fouling encrustations on parts of vessels below the water line, thus becoming stowaways; some of the Thames mitten crabs may have arrived from Europe in this manner.

For much of their life mitten crabs inhabit fresh water and are sometimes found in the upper courses of rivers. They are not totally independent of the sea, however, and must return there to breed. As sexual maturity approaches in their fourth or fifth year, at carapace lengths of 38-50mm, they begin migrating towards the sea. These downstream movements start in late summer and bring together isolated populations as they leave tributaries for the main course of a river. The crabs reach puberty during the final stages of the journey, usually in the brackish waters of tidal estuaries. Male crabs are the first to arrive and mating commences as soon as the females reach the estuaries. It is essential that mated females continue to move seaward as the eggs are spawned about 24 hours after mating, and the cement-like substance that fixes the eggs to hairs on the abdominal limbs appears to harden effectively only in water having a salinity above 26 p.p.t. These ovigerous females remain in the deep waters beyond river mouths throughout the winter whilst the eggs are slowly developing. During the following spring they return to river estuaries seeking brackish water in which to hatch their eggs. After releasing the larvae any further migration upriver seems limited by the amount of internal food reserves in the now exhausted and usually emaciated crabs. Most of the males and spent females gradually die. The success of this single reproductive event is optimised by the production of an enormous number of eggs varying, according to body size, from 250 thousand to over 1 million (Hoestlandt 1959). The minute larvae (zoea) measure about 1.7 mm total length. They swim and drift in tidal estuarine waters passing through five zoeal stages before moulting into a form (megalopa) adapted for bottom-living on the river bed. The megalopas gradually move upstream into fresh water, where they develop into tiny crabs (Figs 2-4).

In fairly low densities, and in the presence of sufficient food, mitten crabs do not usually wander beyond the upper tidal regions of rivers. Further upstream migrations only occur when small two-year-old crabs compete for space with older ones returning to brackish water during spring. At these times river channels may become crowded and the smaller crabs are often forced to move further upstream away from the densely populated regions. It is these upstream movements that are usually observed and reported as the crabs become progressively more active as temperatures rise during March. Further wanderings are governed chiefly by the availability of suitable water reservoirs and feeding grounds.

In the 1930s, when enormous populations of mitten crabs became a major pest in Germany, the largest number caught on a single day was 113,960, and from January to May of 1935 12,166 kg of crabs were taken from the River Weser (Panning 1938). When the crabs encounter barriers during their migrations they pile up against the obstructions forming mounds, and some may eventually leave the water and wander into streets, gardens and even houses. Such invasions occurred during the 1981 Netherlands plague of mitten crabs when they also caused serious damage to fishing nets (Anon 1981).

Mitten crabs are proficient burrowers and the burrows undoubtedly afford protection from predatory birds and against attack from other crabs during the vulnerable period of moulting. In suitable soft river banks they form horizontal and vertical tunnels up to 30 per square metre, 20-80 cm in depth and 2-12 cm diameter, wide enough to allow the crab easy passage (Hoestlandt 1948). In tidal waters the burrows open between the level of high and low water, and although uncovered at low tide they slope downward so the lowest part always retains some water. Extensive burrowing can cause eventual collapse of river banks although this usually occurs only when new burrows are excavated in the same area of bank over a period of years. More serious is the undermining of support structures such as boulders or stones, used to consolidate banks which, in regions of strong tidal currents, can lead to breaching of dyke walls.

It is not clear why mitten crabs have failed to colonise British rivers, especially in view of their abundance in continental waterways during the 1930s. These population explosions seem to have coincided with a reduction or disappearance of fishes, natural predators of mitten crabs, caused by changes in water quality as a result of industrial development and increased shipping. Many British rivers have experienced similar changes and many would appear to provide the tidal salinity gradients necessary for development or larval and young mitten crabs. However, compared with the lowland rivers of central Europe, British and Scandinavian rivers are faster flowing (Haahtela 1963) a factor which may preclude successful upriver migration essential to the crab's development. It is not known whether the sightings of mitten crabs in the Humber and Thames represent only isolated introductions, (resulting perhaps from water deballasting), or are, in fact, an indication of breeding populations. The growing numbers of crabs in the Thames perhaps supports the latter contention (Andrews *et al.* 1982).

In the Far East, mitten crabs are one of the intermediate hosts of lung flukes, one species of which, *Paragonimus ringeri* (Cobbold), occurs in humans (André 1946). Infection results from eating raw or partly cooked mitten crab meat, which in China and Japan is a gastronomic delicacy. The importation of mitten crabs from the Far East into Europe for human consumption takes place, if at all, on an extremely small scale and is restricted to certain Oriental communities. Establishment of the human lung fluke requires a combination of human carriers, suitable water snail intermediate hosts, the presence of mitten crabs or related hosts, and poor sanitation. It is improbable that these factors coexist in northern Europe and the risk of *Paragonimus* being present in naturally occurring European populations of mitten crabs can be discounted.

Mitten crabs have not been reported from British waters since 1984* but no doubt they are still present. To assist in monitoring the crab's progress the author would be grateful for information or specimens of any crab that resembles the illustration or fits the description given in the above account.

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*See footnote, p.101.

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Book Review

God's Acre. The Flowers and Animals of the Parish Churchyard. By Francesca Greenoak. Illustrated by Clare Roberts. Orbis, London. 1985. 192 pp., over 100 illust. £12.95. ISBN 0 85613 800 2.

Nature conservation in churchyards is a fairly new concept. Francesca Greenoak gives a reminiscent account of many plants and animals surviving in 'God's Acre', often familiar, sometimes rare in a regional or even national context, and occasionally distinct local forms lost from the changing countryside around. She shows that new techniques of mowing and weed control can oust them irreversibly, destroying their varied churchground habitats and cover. Once a churchyard refugee, *Holosteum umbellatum* is now extinct in Britain! Tactful prompting must ensure a more enlightened care. Attention is drawn also to religious imagery associated with nature and to traditions linked with consecrated ground.

The text is interspersed with lines from sympathetic poets. An excellent article on Dyfed's Eglwys Newydd Churchyard is contributed by Mr A. O. Chater, B.S.B.I. Recorder, and Dyfed churchyards inspire a number of Clare Roberts' delicate illustrations. Well-known plants, attractively life-sized, generally in colour, take precedence over the fauna, whose diversity is well conveyed, usually in black and white, with insects, however, coloured. Sketches from three of London's burial grounds are shown. Captions are pleasingly informative though 'haws' should not have passed for 'hips'. Latin names are confined mainly to the comprehensive index. Listed books include the Collins' guides.

Churchyards are described in every conceivable setting, and help is acknowledged from Women's Institutes' surveys and appropriate specialist sources. Lavishly produced and refreshingly unintimidating, *God's Acre* presents material of interest to a general readership and heightens awareness of the heritage portrayed.

Stella Luce

Mites of the Grey Squirrel *Sciurus carolinensis* Gmelin in Epping Forest

by K. R. Snow*

In Epping Forest the ectoparasites recorded from the grey squirrel are the flea *Orchopeas howardi howardi* (Baker) (Snow and Ball 1984) and the lice *Enderleinellus longiceps* (Kellog & Ferris), *Hoplopleura sciuricola* (Ferris) and *Neohaematopinus sciuri* (Jancke) (Snow 1985). Elsewhere in this country these same ectoparasites have been recorded from grey squirrels in Delamere Forest, Cheshire (Britt and Molyneux 1979, D. P. Britt, personal communication). It is known that the grey squirrel, a native of North America, was introduced into this country on many occasions during the nineteenth and early twentieth centuries and it would appear that they were accompanied by their flea and louse ectoparasites.

The only record of mites on British grey squirrels is from Delamere Forest, Cheshire (Britt and Molyneux 1979). These authors reported the presence of the dermanyssid mites *Androlaelaps fahrenholzi* (Berlese) and *Hyperlaelaps microti* (Ewing) and nymphs of the phoretic mite *Acarus* sp. (later identified as *A. nidicolous* Griffiths, D. P. Britt, personal communication). Other reports of ectoparasites of grey squirrels in this country, e.g. Jawdat (1975), Keymer (1983) do not record the presence of mites.

On examining 96 grey squirrels (55 males and 41 females) from five sites in Epping Forest (Pole Hill, Leyton Flats, Ambersbury Banks, Sewardstonbury and Woodbury Hollow) during 1982-84, three species of mite were encountered. The method used for the collection of the hosts and the recovery of the mites is given by Snow (1985).

The mites present on Epping Forest grey squirrels were the dermanyssids *Androlaelaps fahrenholzi* and *Eulaelaps stabularis* (Koch) and the trombiculid *Neotrombicula autumnalis* (Shaw) (Fig. 1). Twenty of the 30 hosts examined (66.7%) were infected with *A. fahrenholzi*, while 16 (53.3%) were parasitized by *E. stabularis* and only 5 (16.7%) by *N. autumnalis*. Statistically no significant difference (P=0.05) was found between the infestations of male and female squirrels.

The distribution of mites on the surface of the squirrels (Table 1) shows that no mites were found on the head of the hosts and that the posterior regions of the body, especially the tail, are favoured sites. A total of 356 *A. fahrenholzi* were recovered (mean 11.9 per squirrel) compared with 176 *E. stabularis* (5.9) and 47 *N. autumnalis* (1.6).

Compared with the findings of Britt and Molyneux (*loc. cit.*) for squirrels in Cheshire, no specimens of *H. microti* and *A. nidicolous* were found, but *E. stabularis* and larvae of *N. autumnalis* were present. *A. fahrenholzi* was common to both surveys.

From southwest Georgia in the United States of America, Morlan (1952) recorded *Parasitus americanus* (Berlese), *Androlaelaps fahrenholzi* (Berlese) (as *Haemolaelaps glasgowi* (Ewing)), *Androlaelaps casalis* (Berlese) (as *Haemolaelaps megaventralis* (Strandtmann)), *Ornithonyssus bacoti* (Hirst) (as *Bdellonyssus bacoti), Euschoengastia* sp., *Eutrombicula alfreddugesi* (Oudemans) (as *Trombicula alfreddugesi), E. splendens* (Ewing) (as *T. splendens)* and *Neotrombicula whartoni* (Ewing) (as *T. whartoni)*. From Virginia, Parker (1968) reported grey squirrel infestation with *Haemagamasus reidi* Ewing (as *H. ambulans*

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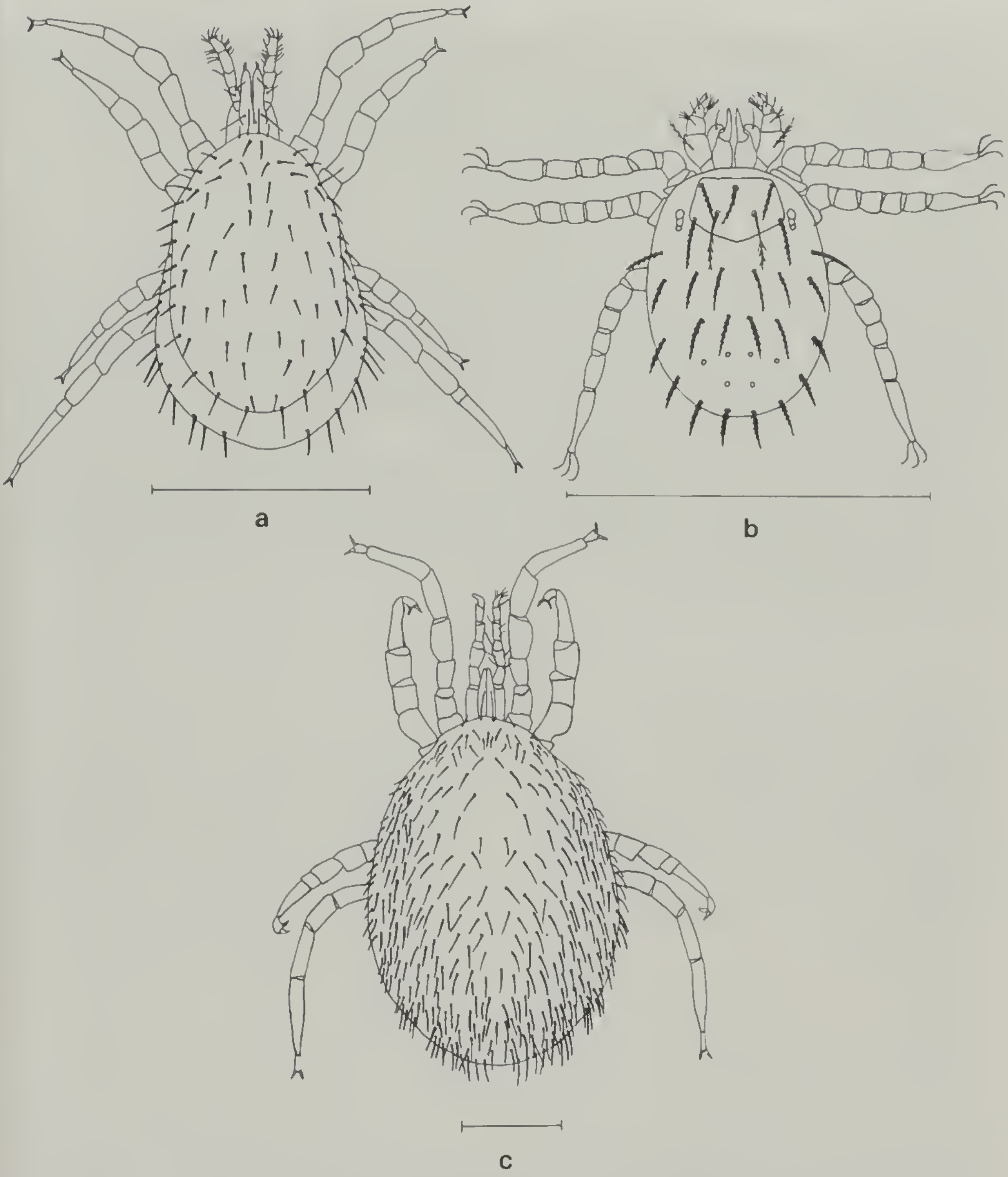

FIG. 1. Dorsal views of the mites found on grey squirrels in Epping Forest (all leg setae omitted). (a) *Androlaelaps fahrenholzi* female, characterised in both sexes by the presence of 39 pairs of setae on the dorsal shield, (b) *Neotrombicula autumnalis* larva, characterised by only 3 pairs of legs and 7 setae on the dorsal shield, (c) *Eulaelaps stabularis* female, characterised in both sexes by dorsal shield with numerous setae. The bars equal 0.5mm.

TABLE 1. Number of mites recovered from 30 adult grey squirrels from Epping Forest.

BODY REGION	*A. fahrenholzi*	*E. stabularis*	*N. autumnalis*
Ears	0	0	0
Head	0	0	0
Front legs	0	1	0
Back legs	12	20	2
Anterior dorsal	45	25	5
Posterior dorsal	28	31	8
Anterior ventral	32	13	5
Posterior ventral	40	21	11
Tail	186	53	16
Unknown location	13	12	0
ENTIRE BODY	356	176	47

(Thorell)), *Androlaelaps casalis* and unidentified species of *Haemagamasus* and *Echinolaelaps*. From the same state, Parker and Holliman (1972) also recorded *H. reidi* and *A. casalis* together with unidentified trombiculids. It is therefore apparent that imported and American grey squirrels have only *A. fahrenholzi* in common. *E. stabularis* and *H. microti* are confined to Europe, the former having previously been recorded on the bodies and in the nests of rodents and insectivores and in the nests of the wheatear *Oenanthe oenanthe* and the sandmartin *Riparia riparia,* while the latter is recorded from voles *Microtus* spp., ship rats *Rattus rattus,* wood-mice *Apodemus sylvaticus* and *'Mustela vulgaris'* (Evans and Till 1966). *N. autumnalis* is essentially a European species but has been recorded in Colorado and Nebraska in the U.S.A. (Kepka, 1964). *N. autumnalis* occurs on a wide range of hosts. *A. fahrenholzi* is a cosmopolitan parasite, found chiefly on rodents and in their nests. It is also recorded from birds, bats and carnivores (Evans and Till 1966).

E. stabularis, H. microti and *N. autumnalis* therefore represent newly acquired ectoparasites for grey squirrels following their introduction to Britain and join *A. fahrenholzi,* which because of its common appearance on squirrels in North America and in two areas of Britain, may have been introduced into this country with its grey squirrel host.

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A Working List of the Hoverflies (Diptera: Syrphidae) of the London Area

by C. W. Plant*

Introduction

Hoverflies are amongst the most familiar of insects to many naturalists, gardeners and others. The vast majority are quite harmless to man's activities, and indeed several are positively beneficial, their larvae probably consuming more garden aphids in a season than an equivalent number of ladybird larvae. Several species can be used as indicators of habitat quality, particularly those associated with woodland and ancient meadows. In recent years their identification has become a comparatively simple task, and the publication of the book *British Hoverflies* by A. E. Stubbs and S. J. Falk in 1983 has made the study of this dipterous family available to a wider audience of non-specialists in the natural history field.

It is surprising then to discover that rather little is known about the distributions of hoverflies in the London area. Several of the commoner species are frequently encountered in the centre of the metropolis, particularly immigrants such as *Meliscaeva auricollis* and *Volucella zonaria*, and very common residents such as *Episyrphus balteatus* and *Platycheirus albimanus*, but even for these examples their true distribution across the whole of our area is imperfectly known.

The list which follows therefore is an attempt to summarise all the species known to have ever occurred in the London area, (within twenty miles of St Paul's Cathedral). Rarer species are annotated with the available information, but the absence of any annotation is no indication that the insect is either widespread or common. The annotations RDB 2 and RDB 3 relate to categories two and three of the Invertebrate Red Data Book, as noted in Falk, S. J. 1985, A Provisional Review of the Status of British Diptera, *Invertebrate Sites Register Report Number 62*, Peterborough: Nature Conservancy Council.

Sources of Records

Records of hoverflies in London have come from a wide range of sources. In recent years there has been considerable field work by the author and others, and this has resulted in a great volume of records for the majority of the commoner species as well as lesser quantity for some of the less frequent ones. Extensive searches have also been made of the literature in order to glean information on the older records. A bibliography of works referred to appears after the list of the flies themselves. A search has also been made of the national recording scheme data held by Dr Philip Entwistle at Oxford, whilst several private collectors and museums have provided additional data. The records held by the Essex Biological Records Centre at the Passmore Edwards Museum have also been taken into account.

Our knowledge of London's hoverflies is a very long way from complete, and it is the author's desire that this list should stimulate a plethora of additions to flow in his direction! Specimens and photographs for identification are welcomed at the author's address, and these should bear the details of place and date of capture, together with the collector's or photographer's name. Specimens and photographs will, of course, be returned to the sender, more rapidly if a contribution towards postage is included!

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List of Hoverflies Recorded in the London Natural History Society Recording Area

SYRPHIDAE

SYRPHINAE

Bacchini

Baccha elongata (Fabricius).
B. obscuripennis (Meigen).
Melanostoma mellinum (Linnaeus).
M. scalare (Fabricius).
Platycheirus (Pachysphyria) ambiguus (Fallen). Very few recent records are available for this early spring species.
P. (Platycheirus) albimanus (Fabricius).
P. (P.) angustatus (Zetterstedt).
P. (P.) clypeatus (Meigen).
P. (P.) discimanus Loew. Farningham, Kent 1909 (Chandler 1969). Stents Wood, Bookham Common (Parmenter 1950).
P. (P.) fulviventris (Macquart). Apparently a very local species.
P. (P.) immarginatus (Zetterstedt). Stone Marshes, Kent 1939 (Chandler 1969). Finchley, Middlesex (Cowley 1949b).
P. (P.) manicatus (Meigen).
P. (P.) peltatus (Meigen).
P. (P.) scambus (Staeger). Cassiobury Park, Watford, a female in 1985 (A. Godfrey).
P. (P.) scutatus (Meigen).
P. (P.) sticticus (Meigen). Darenth, Kent [coll Stephens in coll BM(NH)]. Eltham, Kent 1902 (Andrews 1903).
P. (P.) tarsalis (Schummel).
Pyrophaena granditarsa (Forster).
P. rosarum (Fabricius).
Xanthandrus comtus (RDB 2) (Harris). Darenth, Kent 1867 (Verrall 1901); Eltham, 1900, Beckenham 1940 and Blackheath 1965 and 1966, all Kent (Chandler 1969); Shoreham, Kent 1986 (Plant).

Paragini

Paragus (Pandasyopthalmus) haemorrhous Meigen.

Syrphini

Chrysotoxum bicinctum (Linnaeus).
C. cautum (Harris).
C. elegans Loew. (RDB 3) Eynsford 1937 (Chandler 1969). Bookham Common 1948 (Parmenter 1950).
C. festivum (Linnaeus).
C. octomaculatum Curtis. (RDB 2) Limpsfield (Parmenter 1938a).
C. verralli Collin.
Dasysyrphus albostriatus (Fallen).
D. lunulatus (Meigen). Blackheath, Kent in 1962 or 1963, and Bexley, Kent 1939 (Chandler 1969). Hendon, Middlesex (Cowley 1949b).
D. tricinctus (Fallen).
D. venustus (Meigen).
Didea alneti (Fallen). (RDB 1). Joydens Wood, Kent – a single female on 19.ix.1931 (Andrews 1931 and 1932).
D. fasciata (Macquart). Bexley, Kent 1904, 1911, 1928 and 1939 (Chandler 1969). Whippendell Woods 1985 (A. Godfrey).
D. intermedia Loew. Joydens Wood, Kent 1931 (Andrews 1932). Of this record, Chandler (1969) remarks that there are no specimens of this species in the H. W. Andrews collection, and that this species and *D. fasciata* were at that date often confused. However, Andrews was familiar with *D. fasciata* and so the record may be correct.
Doros conopseus (Fabricius). (RDB 2) Moses Harris found this species at West Tilbury at the end of the eighteenth century (Payne 1973/74); Mickleham, Surrey 1950 (Parmenter 1950a).
Epistrophe (Epistrophe) diaphana (Zetterstedt). Bookham Common 1934 and 1947 (Parmenter 1950); Mitcham Common (Hadley 1982).
E. (E.) eligans (Harris).
E. (E.) grossulariae (Meigen).
E. (E.) nitidicollis (Meigen).
Epistrophe (Epistrophella) euchroma (Kowarz). (RDB 3) Bexley, Kent 1939 (Chandler 1969). Bookham Common (Parmenter 1950).

Leucozona (Ischyrosyrphus) laternaria (Muller). Otford, Bexley and Farningham (Andrews 1932). Bromley, Blackheath, Otford, Keston Common and Chislehurst, Kent (Chandler 1969). Oxshott, Surrey and Mill Hill, Middx., 1937 (Parmenter 1938b); Whippendell Woods 1985 (A. Godfrey).

L. (I.) glaucia (Linnaeus). Orpington, Kent – a female in 1964 (Chandler 1969). Whippendell Woods 1982 and 1985 (A. Godfrey and M. Aldridge).

L. (Leucozona) lucorum (Linnaeus).

Melangyna (Melangyna) barbifrons (Fallen). Farningham 1909, and Bexley, 1912 (Chandler 1969). Sidcup 1902 (Andrews 1903).

M. (M.) compositarum (Verrall).

M. (M.) labiatarum (Verrall).

M. (M.) lasiophthalma Zetterstedt).

M. (M.) quadrimaculata Sydenham, Kent 1895 and Farningham, Kent 1911 (Chandler 1969). (Verrall) Bricket Wood, Herts. 21 March 1893 (Verrall 1901).

M. (M.) umbellatarum (Fabricius).

M. (Meligramma) cincta (Fallen).

M. (M.) guttata (Fallen). (RDB 3) Bexley 1913 (Chandler 1969).

M. (M.) triangulifera (Zetterstedt). (RDB 3) Blackheath 1962 and 1966 (Chandler 1969). Horsenden Hill (Hadley 1982); Dagnam Park, Essex 1981 (D. A. Smith).

Meliscaeva auricollis (Meigen).

M. cinctella (Zetterstedt).

Metasyrphus corollae (Fabricius).

M. latifasciatus (Macquart).

M. latilunulatus (Collin). Eynesford, Kent 1937 (Chandler 1969); Grays Chalk Pit, Essex 1986 (P. Harvey).

M. luniger (Meigen).

M. nitens (Zetterstedt). Darenth Wood and Erith Marshes, Kent 1938 (Chandler 1969). Bookham Common (Parmenter 1950).

Parasyrphus lineolus (Zetterstedt). Bexley, Kent 8.vii.1911, a single specimen (Chandler 1969).

P. punctulatus (Verrall). Bexley 1912 and 1941, Farningham 1946, Keston Common 1936 and Blackheath 1962 or 1963 (Chandler 1969). Limpsfield (Parmenter 1938a); Epping Forest (Hanson 1985).

P. vittiger (Zetterstedt). Keston Common 1964 (Chandler 1969).

Scaeva pyrastri (Linnaeus).

S. selenitica (Meigen). West Wickham Wood (Verrall 1901). Eltham (Woolwich Survey), Otford, Kent 1957 (Chandler 1969). Bookham Common 1946 (Parmenter 1950); Wanstead 1960 (Payne 1973/74); Dagnam Park 1970s (D. A. Smith).

Sphaerophoria spp. Considerable caution must be adopted when considering earlier published data. In recent years it has become apparent that the only truly reliable means of determining the males is by genitalic examination – a very easy task involving hinging out the last few segments of the abdomen for examination under suitable optics. The character of wing to body ratio is not always reliable, since I have examined males of both *S. menthastri* and *S. philanthus* in which the abdomen extends quite beyond the wing tips. Females are still beyond identification at the time of writing. Old published records not backed up by a voucher specimen are rejected.

Sphaerophoria loewii Zetterstedt. (RDB 2) Verrall (1912) lists Gravesend as a locality. This town straddles the border of the London area, and the fly may or may not be correctly included here. For the time being I have omitted it from the species totals at the end of this list.

S. menthastri (Linnaeus). Records are very few and indicate that the species is rather rare in London.

S. rueppellii (Wiedemann).

S. scripta (Linnaeus).

S. taeniata (Meigen). Wimbledon Common 1952 (Speight 1973); Epping Forest 1980 (Hanson 1985).

Syrphus ribesii (Linnaeus).

S. torvus Osten. Sacken Apparently rare, but almost certainly overlooked.

S. vitripennis Meigen.

Xanthogramma citrofasciatum (De Geer).

X. pedissequum (Harris).

MILESIINAE

Callicerini

Callicera aenea (Fabricius). (RDB 2) Oxshott, Surrey, 1937 (Parmenter 1938b). Bromley, Kent 1959 (Chandler 1969).

Cheilosiini

Cheilosia albipila Meigen. Epping Forest 1896 (Hanson 1985). Farningham 1909 and 1936 and Bexley 1943 (Chandler 1969). Ruislip 1937 (Parmenter 1938b); Bookham Common, 1947 (Parmenter 1950).

C. albitarsis Meigen.

C. antiqua Meigen. Bexley, Kent, before 1907, then 1934, 1936, 1939, 1941 and 1942 (Chandler 1969).

C. barbata Loew. Shoreham 1934 Eynsford 1935 and Stone 1964 – all Kent (Chandler 1969). Bookham Common (Parmenter 1950).

C. bergenstammi Becker. A variety with bare eyes has also been recorded sparingly in the eastern sector.

C. carbonaria Egger. (RDB 3) Bookham Common (Parmenter 1950).

C. chrysocoma (Meigen). Finchley, Middx. (Cowley 1949b).

C. cynocephala Loew. (RDB 3). Charlton 1892 and 1894, Darenth 1909, and Bexley 1943 – all Kent (Chandler 1969).

C. fraterna (Meigen).

C. grossa (Fallen).

C. honesta Rondani. Bookham Common 1942 (Parmenter 1950); Epping Forest 1979 (Hanson 1985).

C. illustrata (Harris).

C. impressa Loew.

C. intonsa Loew. Blackheath 1962 and 1964; Petts Wood 1938, Abbey Wood 1938 and Belvedere 1942 – all Kent (Chandler 1969). Bookham Common (Parmenter 1960); Epping Forest 1978 (Hanson 1985).

C. longula (Zetterstedt).

C. mutabilis (Fallen). (RDB 3). Blackheath 1962 and 1966, and Farningham 1909 – both Kent (Chandler 1969).

C. nasutula Becker. Bookham Common (Parmenter 1950).

C. nebulosa Verrall. (RDB 3) Bookham Common 1946 (Parmenter 1950).

C. nigripes (Meigen). Deptford and Blackheath, Kent, 1961 and 1964 (Chandler 1969).

C. pagana (Meigen).

C. praecox (Zetterstedt), Keston Common 1936, Farningham 1943, Bexley 1945, Eltham 1946 and Eynsford 1937 – all Kent (Chandler 1969). Limpsfield (Parmenter 1938a); Bookham Common (Parmenter 1950); Epping Forest 1979 (Hanson 1985).

C. proxima sensu Stubbs.

C. species D sensu Stubbs.

C. species E sensu Stubbs.

The last two species both run to *C. proxima* (Zetterstedt) using Coe (1953b), and the recent list by Falk (1985) returns both of these to variations of that species. In the present absence of published taxonomic evidence however, I have felt justified in retaining the designations of Stubbs for the time being.

C. scutellata (Fallen).

C. semifasciata Becker. Darenth Wood, Kent 1895 (Collin 1931).

C. soror (Zetterstedt). Eynesford, 1937 and 1943, Farningham 1966 (Chandler 1969).

C. variabilis Panzer.

C. velutina Loew. (RDB 3) Stone Marshes 1938, Blackheath and Bromley 1962 – both Kent (Chandler 1969). By Thames between Chiswick Bridge and Barnes railway Bridge, 1957 and 1958 (Uffen 1959); Grays, Essex 1985 (P. Harvey).

C. vernalis (Fallen).

C. vulpina (Meigen). Darenth Wood 1949 (Chandler 1969). Bookham Common (Paramenter 1950); Grays, Essex 1985 (P. Harvey).

Ferdinandea cuprea (Scopoli).

F. ruficornis (Fabricius). (RDB 2) Epping Forest 1946 (Hanson 1985).

Portevinia maculata (Fallen). Woodford 1981 – only Essex record (Specimens in coll. Passmore Edwards Museum).

Rhingia campestris Meigen.

R. rostrata (Linnaeus). (RDB 2) Finchley, Middlesex (Cowley 1949b); Bookham Common 1946 (Parmenter 1950); Chelsam, Surrey (Coe 1939); Bexley, Kent (Coe 1953b) – this relates to the next – Joydens Wood, Kent (Andrews 1942); Selsdon Woods, Surrey 1961 (Coe 1961). Darenth Wood, Kent 1966 (Philip 1967a and b). Cuckoo Wood, Downe, Kent 1966 (Chandler 1969).

Chrysogastrini

Brachyopa bicolor (Fallen). (RDB 2) Bricket Wood, Hertfordshire 1956 (Andrewes 1957).

B. insensilis Collin. Mill Hill 1956 (Andrewes 1957); Hyde Park 1957 (Uffen 1963);

Blackheath, Kent 1961, 1962, 1965 and 1966 (Chandler 1969). Epping Forest 1983 (Hanson 1985).
B. pilosa Collin. Bricket Wood, Hertfordshire 1956 (Andrewes 1957); Bushey Heath, Hertfordshire, 1985 (A. Godfrey).
B. scutellaris Robineau-Desvoidy. Bexley, Kent 1935 (Andrews 1912). Mill Hill, Middlesex 1955 (Andrewes 1957). Bromley, Kent 1966 (Chandler 1969). Aveley, Essex 1984 (CWP).
Chrysogaster chalybeata Meigen. Westerham, Kent 1894 (Chandler 1969).
C. hirtella Loew.
C. macquarti Loew. (RDB 3) Epping Forest 1981 (Hanson 1985); Dagnam Park, Essex (between 1980 and 1985 (D. A. Smith).
C. solstitialis (Fallen).
C. virescens Loew. South Weald, Essex (D. A. Smith).
Lejogaster metallina (Fabricius).
L. splendida (Meigen).
Myolepta luteola (Gmelin). (RDB 3) Stanmore Common (Hadley 1982); Epping Forest 1980, 1981 and 1983 (Hanson 1985); Cranford Park, Middlesex (Coe 1953b); Headley Warren, Surrey (Withers 1983).
Neoascia geniculata (Meigen). Apparently rather rare.
N. interrupta (Meigen).
N. meticulosa (Scopoli).
N. obliqua Coe. (RDB 3) Loughton 1946 (Payne 1973/74), [this record requires confirmation – (Hanson 1985)]; grid square TQ 48 (Payne 1985).
N. podagrica (Fabricius).
N. tenur (Harris).
Orthonevra brevicornis Loew. (RDB 3) Epping Forest 1980 (Hanson 1985).
O. nobilis (Fallen). Limpsfield (Parmenter 1938a); Epping Forest 1979 (Hanson 1985); Dagnam Park, Essex in the 1970's (D. A. Smith).
O. splendens (Meigen). Epping Forest 1980 (Hanson 1985); Dagnam Park, Essex in the 1970s (D. A. Smith); Cassiobury Park, Hertfordshire, 1985 (A. Godfrey).
Sphegina clunipes (Fallen).
S. kimakowiczi Strobl.

Eristalini
Anasimyia species: In the past there has been confusion in this genus particularly between the species pairs *lunulata/interpuncta* and *transfuga/contracta*. Old records of *lunulata* and *transfuga* are thus regarded with great caution unless a specimen is available for examination.
Anasimyia contracta Claussen & Torp.
A. interpuncta (Harris). (RDB 2) Rainham, Essex 1985 (Plant 1986), and Barking 1985 (I. Wynne).
A. lineata (Fabricius).
A. lunulata (Meigen). Charlton, Kent 1892 [coll Yerbury in BM(NH)] (Chandler 1969) – Specimens not examined by the present author.
A. transfuga (Linnaeus). Epping Forest 1980 (Hanson 1985); Rainham and Barking, Essex in 1985 (Plant 1986).
Eristalinus aeneus (Scopoli).
E. sepulchralis (Linnaeus).
Eristalis (Eoseristalis) arbustorum (Linnaeus).
E. (E.) horticola (De Geer).
E. (E.) intricarius (Linnaeus).
E. (E.) nemorum (Linnaeus).
E. (E.) pertinax (Scopoli).
E. (Eristalis) tenax (Linnaeus).
Helophilus hybridus Loew.
H. pendulus (Linnaeus).
H. trivittatus (Fabricius).
Lejops vittata (Meigen). Woolwich Marshes 1897, Belvedere 1893 and Gravesend 1893 – the latter locality lying across the boundary of the London area (Chandler 1969).
Mallota cimbiciformis (Fallen). (RDB 2) Bookham Common 1946 (Parameter 1950); Wimbledon Common 1951 and 1952 (Jones 1954); Hyde Park, 1953 (Coe 1953a); Colne Valley Park and Stanmore Common (Hadley 1982). Epping Forest 1983 (Hanson 1985).
Myathropa florea (Linnaeus).
Parhelophilus frutetorum (Fabricius).
P. versicolor (Fabricius).

Merodontini
Eumerus ornatus Meigen.
E. strigatus (Fallen).
E. tuberculatus Rondani.
Merodon equestris (Fabricius).
  f. *equestris* (Fabricius).
  f. *narcissi* (Fabricius).
  f. *transversalis* Meigen.
  f. *validus* Meigen.
Psilota anthracina Meigen. (RDB 2) Weald Park, Essex 1985 (P. Kirby).

Pipizini
Heringia heringi (Zetterstedt). Apparently only very locally distributed.
Neocnemodon brevidens (Egger). Mitcham Common – first British record (Hadley 1982); The second British specimen was taken from a park with a pond in north London (Stubbs and Falk 1983).
N. latitarsis (Egger). St Paul's Cray, Kent 1943 (Chandler 1969). Epping Forest 1946 (Parmenter 1953).
N. vitripennis (Meigen) *sensu* Collin, 1960.
The taxonomy of the genus *Pipiza* Fallen is in a rather uncertain state at present. Considerable caution must be exercised in accepting old records without voucher specimens being examined. Records of *P. bimaculata* are particularly suspect, although those given here are proven.
Pipiza austriaca Meigen.
P. bimaculata Meigen. Darenth Wood and Swanscombe Park by Leonard Parmenter (Chandler 1969). Loughton 1963 (Hanson 1985).
P. fenestrata Meigen *sensu stricto.*
P. luteitarsis Zetterstedt.
P. noctiluca Linnaeus *sensu stricto.*
Pipiza sp. form D *sensu* Stubbs.
Pipizella varipes (Meigen).
P. virens (Fabricius).
Triglyphus primus Loew. Apparently scarce, but easily overlooked. Kensington 1929 (Aubertin and Diver 1933); Blackheath, Kent 1965 (Chandler 1969). Barking, Essex 1985 (I. Wynne).

Sericomyiini
Arctophila fulva (Harris). Whippendell Woods, Herts. 1959 and 1964 (M. Aldridge pers. comm.).
Sericomyia silentis (Harris).

Volucellini
Volucella bombylans (Linnaeus).
  f. *bombylans* Linnaeus.
  f. *plumata* (De Geer).
V. inanis (Linnaeus). (RDB 3) Bookham Common (Parmenter 1950); Wimbledon Common (Jones 1954); Wanstead Park 1962 (Payne 1973/74). Several recent records.
V. inflata (Fabricius). Darenth Wood 1908, and Otford 1966 (Chandler 1969). Bookham Common (Parmenter 1950); Great Oaks, Surrey, 1985 (P. Harvey).
V. pellucens (Linnaeus).
V. zonaria (Poda).

Xylotini
Brachypalpoides lenta (Meigen).
Brachypalpus laphriformis (Fallen). (RDB 3) Bookham Common 1953 (Parmenter 1960); Epping Forest 1912 and 1922 (Hanson 1985). Bromley, Kent 1963 (Chandler 1969).
Chalcosyrphus (Xylotina) nemorum (Fabricius).
Criorhina asilica (Fallen). Bexley, Kent 1909 and 1942, Darenth Wood, Kent 1900 and 1949, and Chislehurst, Kent 1870 (Chandler 1969). Bookham Common (Parmenter 1950).
C. berberina (Fabricius). Epping Forest 1951 (Payne 1973/74).
C. berberina (Fabricius) f. *oxyacanthae* (Meigen).
C. floccosa (Meigen). Limpsfield (Parmenter 1942). Aveley, Essex 1984 (CWP).
C. ranunculi (Panzer). Bookham Common (Parmenter 1950); Colne Valley Park (Hadley 1982). Bexley, Kent 1930 (Chandler 1969).
Pocota personata (Harris). (RDB 2) Joydens Wood, Kent, a single male in 1945, and

Blackheath, Kent 1964 and 1966 including a pair *in copula* (Chandler 1969). Epping Forest – reared 1947 (Payne 1973/4).

Syritta pipiens (Linnaeus).

Tropidia scita (Harris).

Xylota abiens Meigen. (RDB 3) Bexley 1934 (Chandler 1969). Epping Forest 1983 (Hanson 1985).

X. tarda Meigen. Bexley, Kent 1934 (Chandler 1969).

X. segnis (Linnaeus).

X. sylvarum (Linnaeus).

X. xanthocnema Collin. (RDB 3) Ingatestone, Essex 1963 (Payne 1973/74). Epping Forest 1983 (Hanson 1985). Whippendell Woods, Hertfordshire, 1985 (M. Aldridge).

MICRODONTINAE

Microdontini

Microdon devius (Linnaeus). Shoreham, Kent 1902 (Chandler 1969).

M. mutabilis (Linnaeus). (RDB 3). Bookham Common 1949 (Parmenter 1950).

Analysis

Species Totals

Syrphinae	72
Milesiinae	121
Microdontinae	2
TOTAL	195

Subtract 47 for which there are no records available since 1970.
BALANCE..........148 species on *current* London list. The currently accepted British total is 256 species.

A Provisional Bibliography of the Syrphidae of the London Area

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I am indebted to Dr P. Entwistle for access to the National Recording Scheme data at Oxford.

Book Reviews

Naturalized Mammals of the World. By Sir Christopher Lever. Longman. 1985. 487pp. £40. ISBN 0 582 46056 5.

This excellent book is written for both amateur and professional naturalist. It deals with exotic species which live outside their natural range and domestic animals which have returned to the wild. The book shows the natural distribution and the naturalized distribution of the species described aided by maps.

Each species' English name is given in bold type with the scientific name in brackets below. Then there is a continent heading with country subheading and under these a concise paragraph of pertinent information. This layout makes for very easy reference, and the information is interesting and readable. The text is illustrated by attractive line drawings by Norma Hansell.

There are informative tables liberally spaced throughout the book indicating such items as the principal introductions of fallow deer to New Zealand, and the earliest records of the introduction of the brown hare to Ireland, etc.

There is a comprehensive appendix and bibliography together with an excellent index.

It is a pleasure to have had the opportunity to review this book, and the writer has learnt many fascinating facts in so doing. This is certainly a 'must' for any naturalist's library.

R. V. GOULDING

Agriculture and the Environment: proceedings of I.T.E. Symposium No 13 held at Monks Wood...1984. Edited by David Jenkins. Institute of Terrestrial Ecology. Cambridge. 1984. 195pp., A4. £7.00. ISBN 0 904282 73 3.

This volume does not suffer in the way many conference publications do, from a lack of evident connection between the content of the various papers presented. Many of the same concerns are expressed in the 30 papers, most of which are by scientists engaged in agricultural or ecological research. Input from the voluntary conservation movement, which might be said to represent the public interest in a way which the men from MAFF cannot, is limited to two ornithological contributions. The editor's preface reports attendance by a few politicians; from the list of participants provided, these can be identified as Lord Melchett and three other peers.

It is not surprising that the refrain in many papers is that more research is needed. Points made against this which should be noted are the difficulty of envisaging who will fund potentially very significant research into the relative reduction of costs and benefits of greatly reduced chemicals on the land; and the decreased usefulness of some past research results due to the lack of co-ordination between different projects. If there is a single conclusion to be drawn by the interested observer of the countryside in lowland England, it is that intensive use of agricultural land will continue but the deterioration of the land as habitat for wild fauna and flora will diminish (the prospect for highland Britain, more vulnerable to economic change, is rather more complicated). This diminution depends on the flow of knowledge between scientist and farmer, at present an irregular trickle of which the symposium was itself a drop.

R. M. BURTON

Hemiptera — Heteroptera of the London Area

PART XVI

by Eric W. Groves*

(Previous parts of this paper have appeared in *The London Naturalist* as follows: Pt. I (**43:** 34-66, 1984); Pt. II (**44:** 82-110, 1965); Pt. III (**45:** 60-88, 1966); Pt. IV (**46:** 82-104,1967); Pt. V (**47:** 50-80, 1968); Pt. Vi (**48:** 86-120, 1969); Pt. VII (**50:** 87-94, 1972); Pt. VIII (**52:** 31-59, 1973); Pt. IX (**54:** 21-34, 1975); Pt. X (**55:** 6-15, 1976); Pt. XI (**56:** 32-43, 1977); Pt. XII (**61:** 72-87, 1982); Pt. XIII (**62:** 69-86, 1983); Pt. XIV (**63:** 97-120, 1984); Pt. XV (**64:** 63-94, 1985). **As the sequential pagination was omitted from the foot of each page in Part XIII, (LN. 62, 1983) readers are asked to insert numbers 270-287 in their issue.**

SOURCES OF RECORDS

(Following on from those given in the Consolidated List in Pt. XV).

(a) Published and Manuscript.

93. Records of Heteroptera from Isabella Plantation, Richmond Park, Surrey, April-Oct. 1984, made by W. R. Dolling and other members of the British Museum (Natural History) staff, on oak trees using the insecticidal fogging method. (Manuscript list communicated by W. R. Dolling, 24.iv.85).

ADDENDUM

(N.B. The page number following the species name refers to the sequential pagination given at the foot of the page on which the same species is dealt with in the main part of this paper).

ARADIDAE (Flat bugs)

Aradus corticalis (Linn.) p.9

Surrey. Oxshott Heath, 1.x.51, *FJC* (SL); Esher Common, 1.x.51, *FJC* (SL).

These two specimens in the British Entomological & N.H. Society's collection were determined by the late Dr A. M. Massee, and as such constitute a new County record for Surrey.

Aradus depressus (Fab.) p.9

Middx. Highgate, xi.1892, *EAN* (C); Enfield Chase, 26.v.63, *RGA* (BM).

Essex. Epping Forest, 19.ix.37, n.c. (SL); 17.ix.55, n.c. (SL); (Chingford) 24.v.1890, by sweeping, *EAN* (C).

Kent. Swanscombe, 9.v.64, in Park Wood, *KCS* (14); Darenth Wood, 2.viii.03, in dried sticks, *WW* (60); 20.ix.03, by beating very old and rotting faggots, *WW* (SL) (60); Wickham Wood, 4.vi.04, under bark, *WW* (6); Shoreham, 24.ii.68, under a stone, KCS (14).

Surrey. Wimbledon Common, 25.v.1893, on birch, *EAN* (C); Seldson, 26.v.26, n.c. (SL), and Selsdon Road, 14.v.21, n.c. (SL); Tadworth (*circa* 1960), on logs in garden, *GEW* (40); Boxhill, 24.v.20 and 17.vi.49, *FJC* (SL); Mickleham, iv.16, *WJA* (SL); Bookham Common, vi.14, *WJA* (SL); 11.vi.39, *KMG* (SL); 25.v.53, n.c. (SL); Oxshott Heath, 14.v.37, *FJC* (SL); Arbrook Common, 29.v.49, *FJC* (SL); and beyond the boundary at Gomshall, viii.1900, large colony under bark of old oak stump, *EAB* (RSM) (38).

Aradus cinnamomeus (Panz.) p.9

Surrey. Oxshott Heath, 28.vii.51 & 2.ix.51, *DL* (SL); 2.viii.57, V instar larva, *DL* (RSM); 28.viii.61, macropterous ♀ by sweeping in hot sunshine, AAA (51); and on the boundary at Byfleet, 9.vii.50, *DL* (SL).

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ANEURIDAE (Bark bugs)

Aneurus laevis (Fab.) p.10

Middx. Highgate, *EAN* (38); Ruislip, *EAN* (38); Ruislip Wood, 10.xi.1882, under bark of mossy stump, *EAN* (C).

Essex. Epping Forest (Theydon Bois), 16.v.53, *LC* (64).

Kent. Darenth Wood, 1959, under elder bark, *B. Cooke* in *AAA* coll. (51); Farningham, 5.xi.64, *KCS* (14).

Surrey. Oxshott Heath, 24.iv.54, *SW* (44); and on the boundary at Effingham, 18.iv.53, under bark, *SW* (44) and beyond at Woking, *GCC* (38); and Windlesham, 18.iv.60, under bark, *GEW* (40).

Aneurus avenius (Duf.) p.10

Kent. Darenth Wood, 1959, under elder bark, *B. Cooke* in *AAA* coll. (51); Knockholt, 4.xii.20, *W. Massee,* det. D. Leston (SL).

Surrey. Caterham, *GCC* (38); Boxhill, 8.vi.38 & vi.39, *FJC* (SL); Mickleham, 2.v.49 & v.49, *FJC* (SL); Bookham Common, 9.ix.49, *AME* (SL); on the boundary at Effingham, 8.v.54, *DGH* 57) (BDK); and beyond at Hurtwood Common, 5.v.40, *ECB* (HD).

ACANTHOSOMIDAE (Shield bugs)

Acanthosoma haemorrhoidale (Linn.) p.10

Middx. St. John's Wood, iv.42, on window ledge of house in Hamilton Terrace, *TRES* (13); Hadley Woods, vii.1891, *G. A. Lewcock* in *EAN* coll. (C).

Essex. Highams Park, Walthamstow, 16.v.1895, by beating, *EAN* (C); Epping Forest, 21.ix.32, *TRE* (64); (Loughton), 1.v.29, *FJC* (64); 1.vi.32, *FJC* (SL); (Theydon Bois); 9.v.53, *LC* (64); Dagnam Park, 17.v.76, *DAS* (89); Kelvedon Hatch, 1.x.78, *DAS* (89).

Kent. Blackheath, 30.viii.64, on brambles in garden of 63, Blackheath Park, *AAA* (51); Lullingstone Park, 17.ix.66, *PJC* (63).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, vi.1893, *H. Heasler* in *EAN* coll. (C); Mitcham Common, 19 & 20.ix.83, *JAH* (93); Coulsdon, ix.45, ix.46 & 5.vi.62, all on *Crataegus, HGD* (65); Banstead Downs, 30.v.54, *LC* (64); Purley, 28.viii.45, *JLH* (64); Caterham (Pilgrim Fort), 19.x.70, on hawthorn, *KCS* (14); Boxhill, 4.vi.05, on birch, *WW* (60); 24.v.30 & 15.ix.34, *FJC* (SL); Ranmore Common, 2.xi.34, on oak, *FJC* (64); Mickleham, 3.x.1895, *WJA* (SL); Claygate, 24.v.53, on oak, *HGD* (65); Bookham Common, 20.viii.1894, beating ash, *WW* (60); Oxshott Common, 6.iv.40, *FJC* (64).

Bucks. Slough (ICBFS), 12.ix.34, on oak *WHG* (41).

Elasmostethus tristriatus (Fab.) (synonym: *Cyphostethus tristriatus)* p.11

Essex. Harold Hill, 26.ix.82, *DAS* (89).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Riddlesdown, 12.x.33, *FJC* (SL); 11.xi.51, on juniper, *WJW* in *FJC* coll. (SL); Headley Lane, 1893, on juniper, *WW* (SL); Boxhill, 15.ix.34, *FJC* (SL); 24.ix.1892, *AJC* (HD); Mickleham, ix.15, *JLH* (64); and beyond the boundary at Shere, x.1885, *EC* in *EAN* coll. (C).

Elasmostethus interstinctus (Linn.) p.12

Herts. Totteridge (Darland's Lake N.R.), 7.x.84, taken in woodland, *JHB* (90).

Essex. Epping Forest (Loughton), 30.vi.1886, on birch, *EAN* (C); and beyond the boundary at Widford, v.53, *JHF* (42).

Kent. West Wickham, 8.x.1898, 10.vi.1899 & 20.ix.1899, on oak, *WW* (60); Westerham, 1897, *WW* (60); Seal, 10.v.64, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, 3.vi.10, on birch, *EAN* (C); Coombe Woods, 13.ix.1882, on birch, *EAN* (C); Mitcham Common, 23.v.53, *LC* (64); 19.ix.83 & 19.x.83, *JAH* (93); Shirley, 6.ix.01, *WW* (60); Headley Lane, 21.v.04, on juniper, *WW* (60); Boxhill, 28.v.16, on birch, *WW* (60); Mickleham, 18.ix.1898 & xi.1898, *WJA* (SL); 4.vi.32, *FJC* (26); Bookham Common, 5.v.35, *FJC* (SL); Oxshott Heath, 1.x.51, *FJC* (SL); Esher Common, 28.vii.50 & 25.ix.51, *FJC* (SL); vii.64, *AAA* (51); West End Common, 5.viii.06, *WW* (60); 13.vii.51, *FJC* (SL); Arbrook Common, 8.xi.33, *FJC* (SL).

Elasmucha grisea (Linn.) p.12

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 10.v.41, *HWJ* (43).

Essex. Epping Forest (Loughton), n.d., *EAN* (C).

Kent. Darenth Wood, 17.ix.66, *PJC* (63); 13.v.77, *KCS* (14); West Wickham, 9.vi.69, on *Betula pubescens, ECP-C* (RSM); Westerham, 4.ix.38, *FDB* (SL).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, 15.vi.1892 & 25.v.1893, on birch, *EAN* (C); Coombe Wood, 13.ix.1882, *EAN* (C); Mitcham Common, 23.v.53, *LC* (64); 19.ix.83 & 24.x.83, on oak and birch, *JAH* (93); Shirley Common, 14.ix.1895, on birch, *WW* (60); Purley, 18.viii.45, *JLH* (64); Headley Lane, 14.v.1894, on birch, *WW* (SL) (60); 29.viii.1896, on birch, *WW* (60); Boxhill, 15.ix.34 & 11.v.35, 1.vi.1885, n.c., (SL); *D. Collins* in *AAA* coll. (51); Mickleham, vii.22, *FJC* (64); Ashstead, 10.ix.38, *FDB* (SL); Bookham Common, 4 & 5.vi.35, *FJC* (SL); 9.viii.66, *PSB* (16); 2.iv.38, *FDB* (SL); Oxshott, 8.xi.33, on oak, *FJC* (SL); 30.iv.38, *FDB* (SL); 29.vi.59, *DGH* (57) (BDK); Esher Common, *AAA* (51); West End Common, 13.viii.51, *FJC* (SL); Arbrook Common, 8.xi.33, on oak, *FJC* (SL); on the boundary at Byfleet, 8.ix.35, *FJC* (SL); Horsley, 18.v.58, *DGH* (BDK); Blackheath, 30.viii.36, common oak, *FJC* (SL) (64) (1/1936-37, 36); and beyond at Chilworth 23.iv.61, *HGD* (65).

Bucks. Slough (ICBFS), 20.vii.34, on *Rubus fruticosus, WHG* (41).

CYDNIDAE (Shield bugs)

Legnotus limbatus (Geoff.) p.13

Middx. Highgate, *JAP* (BM); Hendon, 31.v.1897, in hedges, *EAN* (C).

Essex. Dagnam Park, 24. & 31.v.77, 7.v.78 and 19.v.79, *DAS* (89); Mucking near Stanford-le-Hope, at roots of *Ballota, AAA* (51); and just beyond the boundary at Benfleet, 8.vi.35 and 8.v.46, *FJC* (SL).

Kent. Swanscombe marshes, 9.v.64, *KCS* (14); Darenth Wood, 8.vi.07, by sweeping, *WW* (60).

Surrey. Boxhill, iv.1860, *AB* (HD); Horsley, 12.vi.03, by sweeping, *WW* (SL) (60); 27.vii.03, by sweeping *Stachys, WW* (60) (SL); and beyond the boundary at Shere, *EC* in *EAN* coll. (C).

Bucks. On the boundary at Slough, 2.vi.51, fourteen adults swept from weed-covered air raid shelter in grounds of PILG, *GEW* (31f).

Legnotus picipes (Fall.) p.13

Surrey. Purley, 10. & 17.v.39, 11.v.45. and 4.vi.45, *JLH* (SL); and beyond the boundary at Woking, n.d., *JJW* (RSM).

Sehirus bicolor (Linn.) p.14

Essex. Dagnam Park, 12.v.79, *DAS* (89); Noak Hill, 29.iv.76, *DAS* (89); Grays Thurrock, 6.v.80, *LJ* (77); Mucking, near Stanford-le-Hope, at roots of *Ballota* in company with *Legnotus limbatus, AAA* (51).

Kent. Abbey Wood, 16.iv.53, *DGH* (57) (BDK); Darenth, 10.v.13, on white nettles, *WW* (60); Horton Kirby, 24.iv.66, *KCS* (14); Farningham, 24.iv.37, *EG-S* (SL); Eynsford, 17.vi.1892, *H. Heasler* in *EAN* coll. (C); Bromley 17.ix.66, *PJC* (63); Orpington, 25.v.35 and 10.v.49, *EG-S* (SL).

Surrey. Mitcham Common, 7.ix.83 and 4.xi.83 (in ant hill), *JAH* (93); Hackbridge, 9.vi.53 and 14.iv.52, *LC* (64); vii.51 (III instar larva), 9. & 16.v.53, and 21.vii.51, *JC* (64); Carshalton, on dead-nettle *Lamium* sp. *DC* in *AAA* coll. (51); Coulsdon, 18.v.56, in greenhouse of garden in Fryston Ave., *HGD* (65); 9.v.54, flying around garden in Fryston Ave., *HGD* (65); Boxhill, 24.iv.48 & 21.v.48, *FJC* (SL); West End Common, 28.viii.53, *FJC* (SL); (Black Hills), 4.vi.51, *FJC* (SL); and beyond the boundary at Shere, 5.vi.1884, by sweeping hedgebank, *EAN* (C); 17.vi.1892, *EAN* (C).

Bucks. Slough (ICBFS), 27.iv. & 4.v.33, occurring on *Alliaria petiolata, Lychnis dioica, Heracleum sphondylium, Rubus fruticosus* and *Rumex* sp. *WHG* (41); and just beyond the boundary at Amersham, 21-23.vi.02, n.c. in *FJC* coll. (SL).

Sehirus dubius (Scop.) p.15

Surrey. Chipstead, 27.xi.07, *WW* (60); 27.ix.08, *JJC* (HD); 27.ix.08, in moss and dead leaves on a chalky hillside, *ECB* in *EAN* coll. (C); and beyond the boundary on Whitedown, near Abinger, 8.iv.61, rare, on a chalk slope at roots of the foodplant *Thesium humifusum, AAA* (51).

Sehirus biguttatus (Linn.) p.15

Surrey. Beyond the boundary at Shere, 27.ix.1888, *EC* in *EAN* coll. (C).

Sehirus luctuosus (Muls. & Rey) p.15

Surrey. Boxhill, 26.ix.37, *AMM* (SL); and beyond the boundary at Chobham Common, 1.viii.60, *GEW* (40).

Bucks. Just beyond the boundary at Amersham, v.03, n.c. (SL); and at Hedgerley, 25.v.55, *GEW* (40).

Thyreocoris scarabaeoides (Linn.) p.15

Surrey. Chipstead, 30.iv.32, *FJC* (SL); Headley Lane, 23.iv.05, *WW* (SL); Boxhill, 10.iv.03, *WW* (60); 31.v.30, *FJC* (SL); Mickleham, 1.x.1865, *DS* in *EAN* coll. (C); and beyond the boundary at Shere, 11.ix.1896, *EC* in *EAN* coll. (C); *EC* in *CGH* coll. (RSM).

Bucks. Beyond the boundary at Booker, near High Wycombe, 3.iv.51, a single adult swept from chalk grassland, *GEW* (31f).

SCUTELLERIDAE

Eurygaster maura (Linn.) p.16

Surrey. Reigate, 2.ix.06, by sweeping, *WW* (60) (SL); Headley Lane, 30.vii.05, *WW* (60); Boxhill, vii.38, *C. Henderson* (LSR); 21.vii.41, *FJC* (SL); Bookham Common, 29.vi.50, IV instar, *FJC* (SL); and beyond the boundary at Cold Harbour, 24.v.48, *DJJ* (RSM); and Woking, vii.1897, in marsh by banks of canal, *G. A. Lewcock* in *EAN* coll. (C).

Eurygaster testudinaria (Geoff.) p.17

Surrey. Beyond the boundary at Chobham, 11.x.60, *GEW* (40).

Bucks. Beyond the boundary near Booker, 3.vi.51, *GEW* (40) (EMM **88,** 83).

PENTATOMIDAE

Podops inuncta (Fab.) p.17

Middx. Sunbury Island, *AAA* (51).

Herts. Rickmansworth, 27.v.1900, in moss and under leaves, *WW* (60); and Panshanger Park, W. of Hertford, 20.v.51, *FDB* (SL).

Essex. Near South Weald, 28.iii.76, under a piece of plywood at the foot of a grassy roadside embankment, *JHD* (87); and beyond the boundary at Mucking, *FDB* (SL).

Kent. Swanscombe, in chalk pit, *AAA* (51), Darenth, in chalk pit, *AAA* (51); Darenth Wood, 5.x.76 and 8.xii.76, *KCS* (14); Shoreham, 28.xi.64, *KCS* (14).

Surrey. Banstead, i.v.60, *DGH* (57) (BDK); Bookham Common, 6.viii.1895, under grass refuse, *WW* (60); Weybridge (Oatlands), 18.vi.54, *HDS* (LSR); and beyond the boundary at Woking, 8.iv.41, *FJC* (SL).

Bucks. Chesham, 12.ix.1896, sweeping on chalky ground, *E. G. Elliman* in *EAN* coll. (C); Slough (ICBFS), 4.viii.34, at the base of stems of *Urtica dioica, WHG* (41); 2.vi.51, five adults swept from weed-covered air raid shelter of PILG, *GEW* (31f).

Sciocoris cursitans (Fab.) p.17

Kent. Darenth chalk pit, *AAA* (51).

Surrey. Mitcham Common, 19.iv.53, *LC* (64); Boxhill, 4.viii.01, n.c. (64); ix.1898, *WJA* (SL) (64); 25.iv.20, *HStJKD* (HD); 22.vi.42, *FJC* (SL); and beyond the boundary on Ranmore Common, vi.12, *WJA* (SL).

Aelia acuminata (Linn.) p.18

Surrey. Reigate, 1902, *WW* (60); Mickleham, 22.viii.1897, *WJA* (SL); Esher Common, a single specimen, *AAA* (51); West End Common, 4.vi.51 & 10.ix.51, *FJC* (SL); Horsley, 17.v.52, on *Bromus* sp., *HGD* (65); and beyond the boundary at Shere, n.d., *EAN* in *CGH* coll. (RSM); 25.v.1888, on grasses by sweeping on chalk down, *EAN* (C); *EC* in *EAN* coll. (C); Woking, i.ix.41, *FJC* (SL); (Maybury), 12.viii.49, *FJC* (SL).

Bucks. On the boundary at Slough, 2.vi.51, four adults swept from weed-covered air raid shelter in grounds of PILG, *GEW* (31f).

Neottiglossa pusilla (Gmel.) p.18

Essex. Beyond the boundary at Danbury Common, viii.53, *JHF* (42).

KENT. Eynsford, 17.vi.1892, *EAN* (C).

SURREY. Banstead Downs, singly on several occasions by sweeping, *DC* in *AAA* coll. (51); Oxshott, 2.vii.60, *DGH* (57) (BDK); Weybridge, *JAP* (BM); and on the boundary at Wisley, 2.ix.06, sweeping, *WW* (60); and beyond at Woking, vii.1871, *ES* in *CGH* coll. (RSM).

Eysarcoris fabricii (Kirk.) p.19

ESSEX. Epping Forest, 1949, *FJC* (SL); 22.v.53, *DGH* (57) (BDK); North Weald, 29.v.49, *RDW* (SL); Dagnam Park, 2.vii.77 and 18.ix.76, *DAS* (89); and beyond the boundary at Writtle, viii.53, *JFH* (42); and Sandon, vi.50, *JFH* (42).

KENT. Dartford Heath, 26.vi.77, *KCS* (14); Stone near Dartford, 9.vi.70, *KCS* (14); Greenhithe, 25.v.1902, n.c. (64); Darenth Wood, 10.viii.76, *KCS* (14); Eynsford, *AAA* (51); Downe, *AAA* (51).

SURREY. Croydon, 21.v.45, *DT* (LSR); 21.v.45, *CHT* in *DT* coll. (LSR); 17.vi.45 and 18.v.46, *CHT* (C); Arbrook Common, 26.v.52, 16. & 24.vi.51, *FJC* (SL); Ockham Common, 17.vi.50, *SW* (SL); Boxhill, in woods, *AAA* (51); Horsley, vii.1900, *WJA* (SL); 27.vii.03, *WW* (60); on the boundary at Wisley, 9.vii.05, on *Stachys*, *WW* (60); and beyond at Woking, viii.49, *FJC* (SL); Ranmore Common, 9.vii.1899, *WJA* (SL); and Effingham, 22.vii.49, *FJC* (SL).

BUCKS. On the boundary at Slough, 2.vi.51, two adults swept from weed-covered air raid shelter, in grounds of PILG, *GEW* (31f).

Palomena prasina (Linn.) p.20

KENT. Fawkham, 27.ix.54, *GGES* (HD); Orpington, 30.viii.47, *EG-S* (SL).

SURREY. Ashtead, 5.x.47, *FDB* (SL); 15.v.48, *SW* (SL); Headley, 14.v.1894, *WW* (60); Boxhill, 29.viii.1896 and 31.viii.1898, both on ivy, *WW* (60); 28.viii.37, *FDB* (SL); 29.vi.40 *FJC* (SL); 8.vii.49, *FJC* (SL); near Boxhill, *AAA* (51); West Humble, 7.v.79, *LJ* (77); Mickleham, viii.52, on birch, *HGD* (65); 7.x.56, *DGH* (57) (BDK); 5.vi.1897, *WJA* (SL); 29.v.1898, JLH (64); 13.v.33, *FJC* (SL); Mickleham Downs, 19.ix.47, *FJC* (64) (SL); *FDB* (SL); Bookham Common, n.d., *D. Collins* in *AAA* col. (51); Esher Common, 7.x.52, *FJC* (64); Oxshott Heath, n.d., *AAA* (51); West End Common, 5.x.50, *FJC* (SL); on the boundary at Horsley, 18.v.58, *DGH* (BDK); Ranmore Common, 12.ix.44, *FJC* (64); Clandon, n.d. a single on Privet *Ligustrum vulgare*, *AAA* (51); and beyond at Woking 26.viii.49, *FJC* (SL).

BUCKS. Beyond the boundary at High Wycombe, 5.vi.38, *FDB* (SL).

Dolycoris baccarum (Linn.) p.21

KENT. Darenth Wood, 1905, *WW* (60); Orpington, 15.v.52, *EG-S* (SL).

SURREY. Ashtead, 20.i.48, *FJC* (SL); West End Common, 2.ix.50, *FJC* (SL); Esher Common, 7.vi.49, *FJC* (SL); (Black Hills), 25.vii.52, *FJC* (SL); Oxshott Heath, i.x.51., *FJC* (SL); Ockham Common, 23.viii.48, Vth instar, *FJC* (SL); and beyond the boundary at Horsell Common, viii.49, *FJC* (SL); and at Shere, ii.x.1887, *EC* in *EAN* coll. (C).

BUCKS. On the boundary at Slough (PILG) *circa* 1957, *GEW* (40); and beyond at Booker nr. High Wycombe, 3.vi.51, three adults swept from chalk grassland, *GEW* (31f).

Piezodorus lituratus (Fab.) p.21

MIDDX. Hammersmith (Scrubs Wood), 1984, both adults and juveniles found on lupin and sycamore, on railway land, *DK & JL* (92).

HERTS. Beyond the boundary at Harpenden, 30.viii.40, *HWJ* (43).

ESSEX. Epping Forest, 22.iv.50 & 27.v.50, *FDB* (SL); Ongar Park Wood, 29.v.50, *FDB* (SL); and beyond the boundary at Danbury, 18.x.32, *TRE* (64).

KENT. West Wickham, 17.ix.1898, on oak and 8.x.1898 on bracken, *WW* (60) (SL); Dartford, 20.ix.1890, *DS* in *EAN* coll. (C); Dartford Heath, 23.iii.78, *KCS* (14) (TQ/57B); Darenth Wood (TQ/57R), 10.viii.76, *KCS* (14).

SURREY. Mitcham Common, 11.v.80, *LJ* (77); 19. & 20.ix.83 (beaten from oak-heath habitat) and 26. & 27.ix.83 and 17.x.83 (on gorse), *JAH* (91); Shirley Common, 1.ix.1894, on birch, *WW* (60); Banstead Downs, n.d., infrequent, *D. Collins* in *AAA* (51); Banstead, 23.iii.29, *SW* (SL); Ashtead, 23.v.11, *HStJKD* (HD); Oxshott Heath, 8.vi.32, n.c. (SL); West End Common, 5.x.50 & 20.vi.51, *FJC* (SL); and beyond the boundary at Horsell Common, 16.ix.32, *FJC* (SL); Woking, 3.ix.31, on birch, *CRB* (LSR); (St John's), 18.viii.33, *CRB* (LSR); Byfleet, 18.v.29 & 14.v.49, *FJC* (SL); Pyrford, 19.x.32, on *Ulex*, *FJC* (SL); East Horsley, 6.vi.03, plentiful (one pair *in cop.*) on *Stachys sylvatica, GWK & HJT* (38); and at Blackheath, 30.viii.36, *FJC* (1/**1936-37**, 36) (SL).

Bucks. Just over the boundary at Stoke Common, various dates between 1950-1960, on gorse, *GEW* (40).

Pentatoma rufipes Linn. p.22

Middx. Stanmore, 16.vii.82, *LJ* (77).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 27.ix.83, on oak, *JAH* (91); Hackbridge, 25.ix.53, *F. Kimber* per *LC* (64); Carshalton, n.d., a single adult at MV light, *D. Collins* in *AAA* coll. (51); Shirley, 11.vii.1896, *WW* (60); Headley Lane, 8.vii.03, larva taken by sweeping in a field, *WW* (60); Ashtead Woods, 15.viii.46 & 30.vi.45, *FJC* (SL); Boxhill, 12.vi.43 (V instar), 29.vi.42, 21.vii.41 & 22.vii.43, *FJC* (SL); Bookham Common, 7.vii.48, 16.vii.38 & 8.ix.30, *FJC* (SL); *circa* 1950s, *D. Collins* in *AAA* coll. (51); West End Common, 13.viii.51, *FJC* (SL); Oxshott Heath, 8.vii.53, 12.vii.52 & 28.vii.51, ?*FJC* (64); Oxshott, on oak and sallow, n.d. *AAA* (51); Arbrook Common, 30.vi.52, *FJC* (SL); on the boundary at Byfleet, 6.vii.42, *FJC* (SL).

Bucks. Beyond the boundary at Chesham Park, 12.ix.1896, on paling, *E. G. Elliman* in *EAN* coll. (C).

Eurydema oleracea (Linn.) p.23

Essex. Epping Forest, 13.v.50, *FDB* (SL).

Kent. Bostall, n.d., *AAA* (51).

Surrey. Esher Common, 3.ix.50, *FJC* (SL); (Black Hills), 4. & 11.vi.51, 6.v.53 and 31.v.51., *FJC* (SL).

Bucks. On the boundary at Slough, 2.vi.51, 42 adults swept from weed-covered air-raid shelter in grounds of PILG, *GEW* (31f); and beyond the boundary at Booker, near High Wycombe, 3.vi.51, abundant on *Alliaria petiolata* on the roadside, *GEW* (31f).

Eurydema dominulus (Scop.) p.23

Middx. Finchley, n.d., *EAN* (C).

Kent. Bromley, 13.x.68, indoors on curtain, *PJC* (63).

Picromeris bidens (Linn.) p.23

Essex. Epping Forest, 18.viii.32, on birch, *TRE* (64); 7.ix.47 & 2.ix.50, *FDB* (SL); Dagnam Park, 22.x.75, *DAS* (89); and beyond the boundary at Danbury Common, viii.53, *JHF* (42).

Kent. Dartford Heath, 28.ix.1890, *DS* in *EAN* coll. (C); Darenth Wood (TQ/57Q), 25.ix.76, *KCS* (14); Orpington, 22.x.46, *EG-S* (SL); Westerham, 4.ix.38, *FDB* in *FJC* coll. (SL); Eynsford, ii.viii.34, on hazel, *FJC* (SL).

Surrey. Shirley Common, 1895, *Mr. Barnett* in *WW* coll. (60); 1.x.03, sweeping heather, *WW* (60); Purley, 18.viii.45, *JLH* (SL); Coulsdon, 27.ix.58, *LP* in *DGH* coll. (BDK); Caterham (Pilgrim Fort), 21.ix.68, TQ/3453, on scarp amongst herbage, *KCS* (14); Ashtead Common, n.d., swept two or three times, *DC* (61); Bookham Common, n.d., swept two or three times, *DC* (51); 19.vii.64, *PSB* (16); West End Common, 20.viii.51 & 13.viii.50, *FJC* (SL); Esher Common, 19.ix.1897, *WJA* (SL); i.x.52 & 11.x.48, *FJC* (SL); 28.viii.50, on heather. *FJC* (SL); Oxshott Heath, n.d., a single adult, *AAA* (51); 29.vii.59, *DGH* (57) (BDK); and on the boundary at Wisley, 21.ix.04, by sweeping, *WW* (60); and at Byfleet, 26.viii.41, *FJC* (SL).

Troilus luridus (Fab.) p.24

Essex. Epping Forest, 18.viii.32, V instar larva, *TRE* (64); 25.viii.47 and 21.ix.47, *FDB* (SL).

Kent. Wickham Wood, viii.08, *WW* (SL); Shoreham, v.05, *JLH* (64).

Surrey. Shirley, 1893, on birch, *WW* (60); Coulsdon, ix.45, on hazel, *HGD* (65); Ashtead, 18.ix.38, *FDB* (SL); Headley Lane, 1893, on birch, and x.02, bred from larvae, *WW* (60); Boxhill, vii.09, *WW* (SL); Bookham Common, 2.iv.38, *FDB* (SL); 13.viii.67, V instar larva (bred to adult), *A. S. Wheeler* per *HGD* (65); 5.vi.31, IV instar, *FJC* (SL); West End Common, 5.x.50, *FJC* (SL); Esher Common, 17.ix.51 & 7.x.52, *FJC* (SL); Oxshott Heath 17.ii.27 & 30.iv.38, *FJC* (SL); 17.ix.27, *JLH* (SL); Arbrook Common, 8.xi.33, *FJC* (SL); Ockham Common, ix.1895, cast skin of IV instar larva, n.c., (64); and on the boundary at Ranmore Common, 15.ix.32, on beech, *FJC* (SL); Horsley, 14.v.38, *FDB*

(SL); Effingham, 10.iv.54, on pine, *HGD* (65); and beyond at Woking, 1.ix.41 (V instar and adult) *FJC* (SL); Byfleet 28.vi.41 (III instar) and 6.vii.42, *FJC* (SL); and Pyrford, 19.x.32, *FJC* (SL).

Bucks. Beyond the boundary at High Wycombe, 4.ix.37 (V instar), *DWR* (SL).

Rhacognathus punctatus (Linn.) p.25

Surrey. Bookham Common, 10.v.52, n.c. (SL); Esher, iv.1885, *G. A. Lewcock* in *EAN* coll. (C); Esher, 2.ix.50, *FJC* (SL); and over the boundary at Woking, 17.viii.31, *JJW* in *JJC* coll. (HD).

Zicrona caerulea (Linn.) p.25

Middx. Stanwell, 1930, *AEG* (64).

Essex. Ongar Park Wood, 16.iv.50, *FDB* (SL).

Kent. Shoreham, 17.vii.49, *FDB* (SL); Magpie Bottom, 5.iv.64, a single adult in grass tuft on chalky hillside, *KCS* (14).

Surrey. Headley, 30.vi.1898, *WJA* (SL); Boxhill, 1895, *Mr. A. Beaumont* in *WW* coll. (60); n.d., found singly on three or four occasions, *AAA* (51); 28.vii.83, *K. Alexander* (pers. comm.); Mickleham, 1.viii. & 7.ix.1895, and 23.vi.1896 (V instar larva), *WJA* (60); 13.ix.26 *FJC* (SL); Bookham Common, n.d., a single specimen taken in grass at roadside, *AAA* (51); Esher, xii.1895, *H.Heasler* in *EAN* coll. (C); and beyond the boundary at Gomshall, 15.vi.87, by sweeping in marsh, *EAN* (C).

Bucks. Beyond the boundary at High Wycombe, 4.ix.37, *DWR* in *FJC* coll. (SL).

Gonocerus acuteangulatus (Goeze) p.26

Surrey. Boxhill, 23.v.1865, by beating box *Buxus sempervirens*, *JWD* (EMM **2**, 30) (38); vi.1900, *JJC* (HD); x.10, on yew and x.17 by beating box & yew, both records, *WW* (60); viii.17, *EAN* (C); 11.v.35, 30.viii.48 & 15.ix.34, *FJC* (SL); 20.ix.35♀ & 28.xi.35♂ *AMM* (RSM); 12.ix.53, *DL* (SL); viii.59, mostly on yew, *B. Cooke* in *AAA* coll. (51); Mickleham, 19.x.47, *FDB* (SL); 2.v.49, on yew, *FJC* (SL); 19.x.47, *FDB* (SL); and Leatherhead, 10.vii.33, *FJC* (SL).

Coreus marginatus (Linn.) p.27

Essex. Just outside the boundary at Mucking, 29.ix.51, *FDB* (SL).

Surrey. Bookham Common, 8.vii.56, *DGH* (57) (BDK); n.d., not very infrequent, *D. Collins* in *AAA* coll. (51); West End Common, 21.vii.52 (III & IV instars), 20.viii.51 (IV instar), 30.vii.51 (V instar), 25.viii.52 & 5.x.50, *FJC* (SL); Ockham, 23.viii.48 (V instar), *FJC* (SL); and beyond the boundary at Byfleet, 14.v.49, n.c. (SL); 3.vii.39, *FJC* (SL); 9.ix.35, *FJC* (SL); and Woking, 1.ix.41, V instar, *FJC* (SL).

Syromastes rhombeus (Linn.) p.27

Essex. Beyond the boundary at Widford, viii.53, *JHF* (42).

Surrey. Beyond the boundary at Shere, n.d., *EC* in *CGH* coll. (RSM).

Spathocera dahlmanni (Schill.) p.28

Surrey. Beyond the boundary at Albury, n.d., *EAN* (C).

Bathysolen nubilus (Fall.) p.28

Kent. Darenth, 24.vii.40, *AMM* (HD) (SL); Swanscombe Chalk Pit, 4.ix.64, two adults (one middle sized) and two or three small larvae, at roots of black medick *Medicago lupulina*, *AAA* (51).

Coriomeris denticulatus (Scop.) p.29

Essex. Grays Thurrock, 26.v.80, *LJ* (77).

Kent. Darenth Wood (TQ/57R), 10.vii.76 & (TQ/57Q), 5.x.76, *KCS* (14); Swanscombe Chalk Pit. 4.ix.64, at roots of black medick *Medicago lupulina AAA* (51).

Surrey. Mitcham Common, 23.v.53, *LC* (64); Coulsdon, 28.v.44, *JLH* (SL); Mickleham, 7.vi.24, *FJC* (SL); and beyond the boundary at Ranmore, vi.1899, *WJA* (SL); Gomshall, viii.1899, very common, *EAB* (38); and Shere, n.d., *EC* in *CGH* coll. (RSM).

Bucks. Datchet, 22.viii.52, in gravel pit, n.c. (SL).

Alydus calcaratus (Linn.) p.30

Essex. Beyond the boundary at Danbury Common, viii.53, *JHF* (42).

SURREY. Oxshott Heath, 2.vii.60, *DGH* (57) (BDK); 30.viii.1895, *AJC* (HD), and just over the boundary at Virginia Water, 22.viii.1894, sweeping on the common, *WW* (60); and beyond at Woking, viii.28. *JJC* (HD); Chobham Common, viii.1884 n.c. in *JWD* coll. (RSM); 10.vi.1893 & 6.vii.1896, *AJC* (HD); and Abinger, ix.1899, *EAB* (C).

Rhopalus maculatus (Fieb.) (Synonym: *Aeschyntelus maculatus)* p.31

SURREY. Mickleham, *JAP* (BM); Bookham Common, 7.viii.50, *DL* (SL); West End Common, 20.vii.51 (V instar), 18.vi.51, and 10.ix.51, *FJC* (SL); Esher Common, vii.64, a single adult on marsh cinquefoil *Potentilla palustris* in a damp place, *AAA* (51); and beyond the boundary at Byfleet 8.ix.35 & 20.v.49, *FJC* (SL); and Ewhurst, viii.1889, nymphs (subsequently reared to adult) *EAB* (38).

Rhopalus parumpunctatus Schill. p.31

SURREY. Ashtead, 15.viii.46, *FJC* (SL); Bookham Common, 7.vii.50, *DL* (SL); Esher, *JAP* (BM); Oxshott Heath, 6.ix.02, n.c. in *FJC* coll. (SL); and beyond the boundary at Horsell, 28.viii.49, on heath *Erica, FJC* (SL); Chobham, 12.viii.1899, *AJC* (HD); Wisley, 2.ix.06, by sweeping, *WW* (60) (SL); and Albury Down, 19.ix.31, *FJC* (SL).

Rhopalus rufus Schill. p.32

SURREY. Banstead Downs, 13.ix.52, *FR* in *SW* coll. (44); Oxshott Heath, 10.v.53, *DL* (SL); Esher Common, 15.ix.53, *FJC* (SL); and beyond the boundary at Chobham Common, 3.ix.51, *GEW* (40); and Abinger, viii.1899, n.c. (but probably *EAB*) (RSM).

Rhopalus subrufus (Gmel.) p.32

ESSEX. Beyond the boundary at Benfleet, 5.vi.54, *SW* (44); Widford, viii.53, *JHF* (41), and Sandon, vi.50, *JHF* (41).

KENT. Orpington, 21.vi.47, *EG-S* (SL); Darenth Wood, 31.vii.09, *WW* (SL).

SURREY. Chipstead, 16.viii.52, n.c. (SL); Boxhill, 24.iv.48, *FJC* (SL); 22.ix.51, *DL* (64); 17.iv.54, *SW* (44); n.d., *AAA & DC* (51); Ashtead, 2.vi.45. *FJC* (SL); Bookham Common, 7.viii.50, *DL* (SL); Esher Common, 1.ix.52, *FJC* (SL); 15.ix.53, by Black Pond, *FJC* (SL); on the boundary at Effingham, 14.ix.44, *FJC* (SL); and beyond at Woking, 19.viii.49, *FJC* (SL); Abinger, ix.1899, *EAN* (C); and Gomshall, 9.x.03, *EAB* in *EAN* coll. (C).

Myrmus miriformis (Fall.) p.32

MIDDX. Hammersmith (Scrubs Wood), 1984, occurring on lupin on railway land, *WD, DK, BJ & EJ* (92); Edgware (Scratch Wood), 22.viii.54, ♂ & ♀ in cop., *SW* (44).

HERTS. Beyond the boundary at Berkhamsted, 4.viii.41, *HWT* (43).

ESSEX. Epping Forest, 15.vi.12, III instar larva, *EAB* (38); and beyond the boundary at Danbury Common, 30.vii.60, *JHF* (42).

KENT. Blackheath, n.d., a single example in garden at 63, Blackheath Park, *AAA* (51); Downe, n.d., *AAA* (51); Eynsford, 15.viii.37, *FJC* (SL).

SURREY. Richmond Park, 19.ix.53, on grass, *ARW* (RSM); Mitcham Common, 26.ix.83, on grass, *JAH* (91); Banstead Downs, n.d., *AAA* (51); Riddlesdown, n.d., *AAA* (51); Ashtead, 15.viii.46, *FJC* (SL); Mickleham, 9.vii.1895 and viii.15, *WJA* (64); Boxhill, 15.ix.34, ♂ & ♀ in cop., *FJC* (SL); 21.viii.39 & 4.vii.40, *FJC* (SL); 19,vii.59, several specimens, *KCS* (14); 12.viii.06, by sweeping, *WW* (60); n.d., including two macropterous females, *AAA* (51); 18.vii.83, *K. Alexander* (pers. comm.); Bookham Common, 16.viii.48 and 15.viii.53, *FJC* (SL); West End Common, 29.vii.52 & 4.viii.53, *FJC* (SL); on the boundary at Wisley Common, 11.viii.1899, by sweeping, *WW* (60); and beyond at Woking, 4. & 7.ix.33, *CRB* (LSR); Gomshall, 19.ix.10 ♀ swept from *Calluna, EAB* (EMM **48**, 36) (38); and the hills above Shere, viii.1892, macropterous form common, *EAB* (38).

Dicranocephalus medius (Muls. and Rey.) p.33

BUCKS. Beyond the boundary at Amersham, 9.v.48, *DL* (SL).

Heterogaster urticae (Fab.) p.36

ESSEX. Dagnam Park, 24.vi.79 & 2.vii.77, *DAS* (89); Cranham, 21.vii.76, *DAS* (89).

KENT. Abbey Wood, 2.vii.1898, on nettles, *WW* (60); Darenth Wood, 17.vi.1899, *WJA* (64); and Stone, 27.viii.64, *KCS* (14).

SURREY. Mitcham Common, 1.vii.79, *LJ* (77); 21.x.83, in litter, *JAH* (91); Hackbridge, various dates between 21.-31.iii.53, 3.iv.53, 9. & 17.viii.53, 27.ix.53, 7. & 28.x.52, 10.xi.53

and 4.xii.53, all records of *JC* (64); 14.vii.79, *LJ* (77); and beyond the boundary at Woking, vii.1871, n.c. in *CGH* coll. (RSM).

Heterogaster artemisiae (Schill.) p.37

SURREY. Reigate, 9.viii.1899 and 3.ix.1898, *WW* (60); Mickleham, 19.viii.06, *JJC* (HD); and beyond the boundary at Gomshall, n.d., *EAN* (C).

Ischnodemus sabuleti (Fall.) p.38

MIDDX. Harefield, iv.33, *DCT* (RSM).

HERTS. Panshanger Park, 20.v.52, *DGH* (57) (BDK).

KENT. Blackheath, 12.v.61, a single macropterous adult swept in the garden at 63 Blackheath Park, *AAA* (51).

SURREY. Bookham Common, 12.viii.63, a few macropterous and brachypterous forms near the IOW pond, *DC* (51); 26.ix.64, a single macropterous adult taken by sweeping near the IOW pond, *AAA* (51).

Nysius thymi (Wolff) p.38

MIDDX. Hounslow Heath, 22.x.59, a single adult beneath dock *Rumex* sp., *AAA* (51).

Nysius ericae (Schill.) p.39

KENT. Darenth Wood (TQ/57R), 18.viii.76, *KCS* (14).

Nysius helveticus (H.-S.) p.39

SURREY. Beyond the boundary at Virginia Water, 22.viii.1894, sweeping heath, *WW* (60).

Kleidocerys resedae (Panz.) p.39

ESSEX. Epping Forest (High Beach) 25.ix.82, *DAS* (86).

HERTS. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

KENT. Darenth Wood (TQ/57R), 10.viii.76, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 19.ix.83, beaten from oak-birch habitat, *JAH* (91); Shirley Common, 25.ix.1897, *WW* (60); Oxshott Common, 19.v.01, *WW* (60); on the boundary at Wisley, 28.x.1899, *WW* (60); just over the boundary at Effingham, 10.iv.54, on heath, *HGD* (65); and beyond at Chilworth, 23.iv.61, *HGD* (65).

Kleidocerys truncatulus subsp. *ericae* (Horv.) p.40

SURREY. Shirley, 1893, by sweeping, *WW* (60); Weybridge, n.d., *EAN* (C); just over the boundary at Virginia Water, 22.viii.1894, sweeping heath, *WW* (60); and beyond at Woking, n.d., *EAN* (C); 6.vi.33 & 4.ix.33, *CRB* (LSR); (Knaphill), 16.ix.33, *CRB* (LSR); and at Chobham Common, 24.v.59, *DGH* (BDK).

Peritrechis lundi (Gmel.) p.40

HERTS. Rickmansworth, 27.v.1900, in moss and under leaves, *WW* (60).

KENT. Bostall Woods, n.d., *AAA* (22); Darenth Wood, 20.ix.03, beating faggots very old and rotten, *WW* (60).

SURREY. Shirley Common, 6.v.1900, under leaves, *WW* (60); and Headley Lane, 1.x.05, beneath cut bracken, *WW* (60).

Peritrechus geniculatus (Hahn) Sp.83 p.92 (inadvertently omitted from Pt. II)
D&S p.189 (*P. nubilus*) p.97
Bp.166 (Sp. 100)

Occasional. This species is found amongst dead leaves, in moss, at roots of grass and other low vegetation, on light sandy and chalky soils. The overwintering adults pair in May and during the following two months the larvae pass through their moults, the imagines being found from early August onwards. Bucks. records required.

MIDDX. Hounslow Heath, 22.x.59, a single adult, *AAA* (51).

ESSEX. Dagnam Park, 4.iii.78, 16.iv.80, 30.iv.77 & 14.v.77, *DAS* (89).

KENT. Kidbrooke Lane, 8.v.02, under rubbish, *WW* (60); Darenth Wood, iv.06, amongst faggots, *WW* (60); (TQ/57R) 5.viii.76, and (TQ/57Q) 7.ix.76, *KCS* (14); Bromley, 17.ix.66, *PJC* (63); Farningham Wood, 25.vi.64, *KCS* (14).

SURREY. Mitcham Common, x.83, *JAH* (91); Headley Lane, 9.v.08, under leaves, *WW* (60); and beyond the boundary at Gomshall, n.d. *EAN* (C).

Raglius alboacuminatus (Goeze) p.41

KENT. Dartford, 29.vii.1857, V instar larva *EWJ* per *G. R. Crotch* (C); Darenth Wood (TQ/57Q), 5.x.76, *KCS* (14).

Megalonotus antennatus (Schill.) p.42

ESSEX. Near Hackney Marsh, 1889, *P. W. Janoit* in *EAN* coll. (C).

Megalonotus dilatatus (H.-S.) p.42

MIDDX. Stanmore, n.d., *Mr. Ashby* in *WW* coll. (60).

ESSEX. Highams Park, Walthamstow, 4.vi.1898, by sweeping, *EAN* (C).

SURREY. Barnes Common, 29.iv.13, *HStJKD* (HD); Wimbledon Common, 3.ix.1867, *DS* in *EAN* coll. (C).

Megalonotus chiragra (Fab.) p.42

MIDDX. Hendon, 31.v.1897, side of reservoir, at roots of grass, *EAN* (C).

SURREY. Barnes Common, 29.iv.13, *HStJKD* (HD); Boxhill, xi.08, *WW* (60).

Trapezonotus dispar (Stål) p.44

KENT. Darenth Wood, iv.12, under leaves, and 7.v.05 by sweeping, *WW* (60); (TQ/57Q), 5.x.76, *KCS* (14).

Macrodema micropterum (Curt.) p.44

SURREY. Esher, 17.v.1884, sides of gravel pits, *EAN* (C); Esher Common, n.d., *CGH* Coll. (RSM); Oxshott, 31.v.1887, *EAN* (C); 28.viii.04, by sweeping, *WW* (60); and just over the boundary at Virginia Water, 22.viii.1894, sweeping heath, *WW* (60); and beyond at Chobham Common, 24.v.59, *DGH* (BDK).

Tropistethus holosericeus (Scholtz) p.45

SURREY. Shirley Common, 6.v.1900, in the wood, under leaves, *WW* (60); Headley Lane, 30.v.1898, by shaking moss, *WW* (60); Boxhill, iii.34, *JJC* (HD); and beyond the boundary at Abinger, viii.1899, *EAB* in *EAN* coll. (C).

Acompus rufipes (Wolff.) p.46

SURREY. Beyond the boundary at Shere, 5.vi.1884 and 15.vi.1887, by sweeping in marsh, *EAN* (C).

Stygnocoris rusticus (Fall.) p.46

KENT. Lee (Hither Green Lane), 5.ix.1896, in refuse from haystacks, *WW* (60); Dartford, 20.ix.1890, *DS* in *EAN* coll. (C).

SURREY. Wimbledon Common, 21.viii.1883, in moss in the ravine, *EAN* (C); 10.ix.1882, under herbage in ravine, *EAN* (C); Esher Common, 13.viii.1883, by sweeping in pine plantation, *EAN* (C)) and beyond the boundary on Ranmore Common, 6.viii.05 & 30.vii.11, by sweeping in the rides, *WW* (60).

Stygnocoris sabulosus (Schill.) p.47

ESSEX. Epping Forest, 28.ix.1895, by sweeping, *WW* (60).

KENT. Darenth Wood (TQ/57R), 5.viii.76 and (TQ/57Q), 7.ix.76, *KCS* (14).

SURREY. Shirley Common, 14.ix.1895, sweeping heath, *WW* (60); Coulsdon, 27.vii.57, *DGH* (BDK); Boxhill, iii.1894, under moss and dead leaves, *WW* (60).

Stygnocoris fuligineus (Geoff.) p.48

MIDDX. Bow, 28.ii.79, *DAS* (89); Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

HERTS. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

KENT. Plumstead (Wickham Lane), 29.ix.1894, under broom, *WW* (60); Hither Green Lane, Lee, 5.ix.1896, in refuse from haystacks, *WW* (60); Darenth Wood (TQ/57R), 17.ix.76, *KCS* (14).

SURREY. Mitcham Common, 8.iii.53, *LC* (64); 27.ix.83, swept from grass, *JAH* (91); and beyond the boundary at Virginia Water, 22.viii.1894, by sweeping, *WW* (60).

Plinthisus brevipennis (Latr.) p.48

MIDDX. Greenford, 24.vi.05, in marsh, *EAN* (C).

Ischnocoris angustulatus (Boh.) p.49

SURREY. Headley Lane, 1.x.05, *WW* (60); Esher, 17.v.1884, sides of gravel pits, *EAN* (C).

Drymus pilipes (Fieb.) p.49

SURREY. Betchworth Hill, viii.1870, *ES* (HD).

Drymus pilicornis (Muls.) p.50

SURREY. Headley Lane, 3.iv.1899, under moss, *WW* (60); Boxhill, iii.1894, under moss and dried leaves, *WW* (60).

Drymus sylvaticus (Fab.) p.50

MIDDX. Highgate, 18.iv.1893, in Gravel Pit Wood, sifting dead leaves, *EAN* (C); Hendon, 4.vi.1897, *EAN* (C); Ruislip Wood, 10.xi.1882, in moss on stump, *EAN* (C).

HERTS. Bricket Wood, 15.iv.38, *HWT* (43); Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

ESSEX. Higham's Park, Walthamstow, 8.v.1895 & 4.vi.1898, *EAN* (C); Dagnam Park, 28.v.77, *DAS* (89).

KENT. Woolwich, iv.1880, *EAN* (C); Kidbrooke, 5.vii.1892, *EAB* in *EAN* coll. (C); Darenth Wood (TQ/57R), 1.ix.76, and (TQ/57Q) 7.ix.76, *KCS* (14).

SURREY. Wimbledon Common, 10.ix.1882, under herbage in ravine, *EAN* (C); Coulsdon, 21.v.62, general sweeping, *HGD* (65); Boxhill, iv.1897, *EAN* (C); Bookham Common, 6.viii.1895, by sweeping, *WW* (60); Weybridge (Oatlands), 18.vi.54, *HDS* (LSR); and just over the boundary at Virginia Water, 22.viii.1894, sweeping heath, *WW* (60); and beyond at Shere, 14.vi.1883, by sweeping nettle, *EAN* (C); 22.v.1884, by sweeping hedgebank, *EAN* (C); 25.v.1888, *EAN* (C).

Drymus ryei (D & S) p.51

KENT. Lee (Hither Green Lane), 6.iii.1900, at roots of grass near cemetery, *WW* (60).

SURREY. Coulsdon, 22.v.63, *HGD* (65); Headley Lane, 1.x.05, *WW* (60); Boxhill, iii.1894, under moss and dried leaves, *WW* (60).

Drymus brunneus (Sahlb.) p.52

MIDDX. Highgate, 20.v.1890, in Gravel Pit Wood, sifting dead leaves, *EAN* (C).

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

KENT. Darenth Wood (TQ/57R), 10.viii.76 and (TQ/57Q), 7.ix.76, *KCS* (14).

SURREY. Shirley Common, 20.x.1894 (under refuse), 1896 (under leaves) and 12.v.1900 (under leaves), *WW* (60).

Scolopostethus affinis (Schill.) p.53

HERTS. Rickmansworth, 12.ii.39, *FDB* (64).

ESSEX. Ilford, 7.vi.1882, *EAN* (C); Dagnam Park, 10.iv.77, *DAS* (89); Oaks Wood, near South Weald (TQ 567933), 15.ii.76, under bark of a log cut from an elm affected by Dutch elm disease, *JHD* (87).

KENT. Lee (Hither Green Lane), 5.ix.1896 and 2.x.1897, in field refuse, *WW* (60); Bromley, 17.ix.66, *PJC* (63); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

SURREY. Putney, 18.vii.1883, *EAN* (C); Coulsdon, 2.vi.63 and 23.ix.63, general sweeping, *HGD* (65); Headley Heath, 24.iv.39, *FJC* (64); Headley Lane, 19.vi.39, *FJC* (64); Mickleham Downs, 9.v.36, *FJC* (64); Boxhill, iv.12, shaking dried leaves, *WW* (60); Ashtead, 19.vii.47 and 24.vi.50, *FJC* (64); Esher Common, 21.vii.52, 30.vii.51 & 29.x.51, *FJC* (64); Oxshott Heath, 31.v.50, *FJC* (64); and beyond the boundary on Ranmore Common, 24.xi.36, *FJC* (64); and at Shere, 14.vi.1883, by sweeping hedges, *EAN* (C).

Scolopostethus grandis (Horv.) p.54

ESSEX. Highams Park, Walthamstow, 7.v.1898, *EAN* (C); 18.v.1897, *EAN* (C).

KENT. Shooters Hill, vii.11, sweeping, *EAN* (C).

Scolopostethus thomsoni (Reut.) p.54

Middx. Highgate Wood, 11.vii.1891, by beating nettle, *EAN* (C).

Herts. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85); Rickmansworth, 4.vii.1900, *WW* (60).

Essex. Dagnam Park, 16.iv.77, *DAS* (89).

Kent. Lee (Hither Green Lane), 5.ix.1896, *WW* (60); Darenth Wood, ix.12, shaking moss in the field, *WW* (60); (TQ/57R), 5.viii.76, and (TQ/57Q), 7.ix.76, *KCS* (14); and just over the boundary at Sevenoaks (Knole Park), 6.ix.66, *PJC* (63).

Surrey. Beyond the boundary at Woking, 30.vi.33, *CRB* (LSR).

Scolopostethus decoratus (Hahn.) p.55

Surrey. Wimbledon Common, 13.ix.1882, by sweeping weeds at side of the Beverley Brook, *EAN* (C); Mitcham Common, 20.ix.83, swept from heather, *JAH* (93); Shirley Common, 1.ix.1894, on heath, *WW* (60); Esher Common, 13.viii.51, 10.ix.51, 23.xii.32, & xii.48, *FJC* (64); Oxshott Heath, 31.v.1887, *EAN* (C); 14.iv.03, in moss under heather, *WW* (60); 28.viii.50, *FJC* (64); and beyond the boundary at Woking, 26.viii.41, *FJC* (64); and Farley Heath, 30.v.33, *FJC* (64).

Eremocoris podagricus (Fab.) p.56

Kent. Darenth Wood, i.x.76, *KCS* (14).

Surrey. Mitcham Common, x.83, *JAH* (91); Headley Lane, 23.iv.05 (under moss) and 11.ix.04 (under leaves), *WW* (60).

Taphropeltus contractus (H.-S.) p.57

Middx. Hendon, 26.viii.1898, on Hendon Reservoir at roots of plants, *EAN* (C).

Essex. Epping Forest (Wood St.), 9.v.02, *EAN* (C); Highams Park, Walthamstow, 4.vi.1898, by sweeping, *EAN* (C).

Kent. Darenth Wood (TQ/57R), 8.xii.76, *KCS* (14).

Gastrodes grossipes (De Geer) p.59

Herts. Rickmansworth, 27.v.1900, by beating pines, *WW* (6).

Kent. West Wickham, 26.viii.1899, on pines, *WW* (60).

Surrey. Purley, 18.v.48 and 14.vi.53, *JLH* (14); Boxhill, 31.viii.1898, on spruce, *WW* (60); Shirley Common, 27.viii.02, larvae on pines (bred to adult), *WW* (60); Oxshott Heath, 3.x.1896, x.16 & vi.18, *WJA* (60); and just over the boundary at Wisley, 26.ix.11, on pines, *WW* (60); and beyond on Horsell Common, 13.v.56, *DGH* (BDK); 13.iv.66 ♀ from pine cones *ECP-C* (RSM).

Cymus claviculus (Fall.) p.59

Kent. West Wickham Wood, 17.viii.1900, by sweeping, *WW* (60); Darenth Wood (TQ/57R), 27.ix.76, *KCS* (14).

Cymus melanocephalus (Fieb.) p.60

Herts. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 2.vii.77 and 8.vi.80, *DAS* (89).

Kent. Darenth Wood (TQ/57R), 7.ix.76, *KCS* (14).

Surrey. Richmond Park, 19.ix.53 ♂♂♀♀ *ARW* (RSM); Mitcham Common, 9.ix.79, *LJ* (77); and just over the boundary at Wisley, 9.vii. & 17.ix.05, by sweeping low plants, *WW* (60); and beyond at Woking (St. John's), 18.viii.33, *CRB* (LSR); and Effingham, i.vi.68, *PSB* (16).

Cymus glandicolor (Hahn) p.61

Herts. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

Surrey. Beyond the boundary at Shere, n.d., *EAN* in *CGH* coll. (RSM).

Berytinus crassipes (H.-S.) p.63

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Surrey. Shirley, 11.ix.02, sweeping heath, *WW* (60); Headley Lane, 1.x.05, under cut bracken, *WW* (60).

Berytinus montivagus (Mey.-Dür) p.64

KENT. Swanscombe, 12.vii.64, *PSB* (16).

SURREY. Reigate, 9.viii.1899, by sweeping, *WW* (60).

Berytinus signoreti (Fieb.) p.64

SURREY. Caterham (Pilgrim Fort), 29.ix.68, in herbage on scarp, TQ/3453, *KCS* (14); Reigate, 3.ix.1898, by sweeping, *WW* (60).

Berytinus minor (H.-S.)

KENT. Manor Farm Lane, 16.iv.1900, ponds at the top, sweeping rushes, *WW* (60); Darenth Wood (TQ/57R), 7.ix.76, *KCS* (14).

SURREY. Mitcham Common, 2.ix.79, *LJ* (77); Caterham (Pilgrim Fort), TQ/3453, 9.v.70, amongst grass-roots on the tip, *KCS* (14).

Berytinus clavipes (Fab.) p.66

SURREY. Caterham (Pilgrim Fort), TQ/3453, 21.ix.68, on scarp amongst herbage, *KCS* (14).

Gampsocoris punctipes (Germ.) p.67

SURREY. Caterham (Pilgrim Fort), TQ/3453, 21.ix.68, on Restharrow *Ononis* sp., *KCS* (14); Headley Lane, 2.viii.1897, by sweeping, *WW* (60); Boxhill, viii.15, by sweeping, *WW* (60).

Metatropis rufescens (H.-S.) p.67

KENT. Darenth Wood (TQ/57R), 10.viii.76, *KCS* (14).

Piesma maculatum (Laporte) p.68

HERTS. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

KENT. Plumstead & Abbey Wood marshes, 6.vi.1900, sweeping on swampy ground, *WW* (60); Lee (Grove Park), 19.vi.02, sweeping in the wood, *WW* (60); (Hither Green Lane), 4.vi.1898, by sweeping, *WW* (60); Lee Manor Farm, vi.1891, on thistle, *WW* (60); Kidbrooke Lane, 25.vii.1896, *WW* (60).

Campylosteira verna (Fall.) p.69

SURREY. Coulsdon, 4.iv.06, *ECB* in *WW* coll. (60); Chipstead, v.07, *WW* (60); Walton Heath, 23.iv.07, *WW* (60); Headley Lane, iv.06, in moss, *WW* (60); Boxhill, 19.iv.14, *WW* (60).

Acalypta platycheila (Fieb.) New record Sp. 149 p.142
Butler p.203 (Sp. 141a)

Rare. This is a new record for the London area and probably for the county of Surrey. It is based on a specimen, now in the Leicester City Museum, collected by H. D. Swain in 1954. The species is known to occur in late spring and again in September in moss around bases of trees.

SURREY. Wimbledon Common, 23.v.54, *HDS* (LSR).

Acalypta parvula (Fall.) p.70

ESSEX. South Weald, 6.iii.77, *DAS* (86).

KENT. Bromley, 7.ix.64, *PJC* (63); Darenth Wood, 27.viii.05, *WW* (60); (TQ/57R), 7.ix.76, *KCS* (14).

SURREY. Oxshott Heath, 28.viii.04, in moss on stump, *WW* (60).

Dictyonota strichnocera Fieb. p.71

SURREY. Shirley Common, 28.viii.1897, on broom, *WW* (60); Reigate, 9.viii.1899, by sweeping, *WW* (60); Oxshott Heath, 28.viii.04, on furze, *WW* (60); and beyond the boundary at Woking (St John's), 18.viii.33, *CRB* (LSR).

Dictyonota fuliginosa Costa p.71

MIDDX. Uxbridge (Swakeley's estate), 8.viii.36, *DCT* (RSM).

Kalama tricornis (Schrank) (Synonym: *Dictyonota tricornis*) p.72

SURREY. Headley Lane, 30.vii.05, sweeping in field, *WW* (60); Boxhill, 23.vi.12, by sweeping, *WW* (60); and beyond the boundary on Ranmore Common, vii.10, sweeping in the rides, *WW* (60).

Derephysia foliacea (Fall.) p.72

ESSEX. Dagnam Park, 21.viii.76, *DAS* (89).

SURREY. Beyond the boundary at Woking, 17. & 19.vii.33, *CRB* (LSR); and on Ranmore Common, 30.vii.11, by sweeping, *WW* (60).

Stephanitis rhododendri (Horv.) p.73

BUCKS. Beyond the boundary at Little Chalfont, 17.ix.56, *WJLeQ* (HD).

Tingis reticulata (H.-S.) p.73

SURREY. Boxhill, x.17, in the weathered and curled leaves of Mullein *Verbascum thapsus*, *WW* (60).

Tingis ampliata (H.-S.) p.74

HERTS. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 30.iv.77, 3.vi.81, 20.vi.82 & 25.vi.80, *DAS* (89).

KENT. Lee (Manor Farm) vi.1891, on thistle, *WW* (60); Manor Farm Lane, 16.iv.1900, by ponds at the top, under rubbish, *WW* (60); Chislehurst, 30.vi.68, TQ/4469, *KCS* (14).

SURREY. Mitcham Common, 11.v.80, *LJ* (77); 17.x.83, on gorse, *JAH* (91); Coulsdon, 24.v.63, general sweeping, *HGD* (65); Caterham (Pilgrim Fort), TQ/3453, 9.v.70, amongst grass on Tip, *KCS* (14); Banstead Downs, 30.v.54, *LC* (64); just over the boundary at Effingham, 1.vi.68, *PSB* (16); and beyond at Woking, 4.vii.33 and 30.vi.33, *CRB* (LSR); (Knaphill), 1.vi.33, *CRB* (LSR).

Tingis cardui (Linn.) p.75

KENT. Ruxley Gravel Pit, 8.vii.67, *KCS* (14); Fawkham, 11.ix.54, *GGES* (HD); and Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

SURREY. Beyond the boundary at Effingham, 1.vi.68, *PSB* (16); and at Shere, n.c. in *CGH* coll. (RSM).

Catoplatus fabricii (Stål) p.76

SURREY. Beyond the boundary on Ranmore Common, vi.14, by sweeping, *WW* (60).

Empicoris vagabundus (Linn.) p.78

MIDDX. Chelsea Physic Garden, 4.viii.81, *BNKD* (88).

HERTS. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

KENT. Darenth Wood (TQ/57R), 7.ix.76, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Boxhill, 9.viii.1895, *WW* (60); and just over the boundary on Wisley Common, 11.viii.1899, beating hedge, *WW* (60).

Empicoris culiciformis (De Geer) p.79

Herts. Hoddesdon, 31.iii.78, larva bred through to adult 1.x.78, *ECP-C* (RSM).

Reduvius personatus (Linn.) p.80

ESSEX. Tilbury, 30.vi.67, in a school, *KCS* (14).

Coranus subapterus (De Geer)

SURREY. Headley Lane, 13.ix.03, under stones, *WW* (60); Oxshott Heath, 28.vii.57, *GGES* (HD); and just over the boundary on Wisley Common, 11.viii.1899, *WW* (60); and beyond at Woking (St. Johns), 7.ix.33, *CRB* (LSR).

Nabicula flavomarginata (Scholtz) (Synonym: *Nabis flavomarginatus*) p.81

ESSEX. Dagnam Park, 10. & 23.vii.76, *DAS* (89); and beyond the boundary at Benfleet, 15.viii.38, *FJC* (60).

KENT. Shooters Hill, 19.ix.1900 (developed form), *WW* (60); Burnt Ash near Grove Park, 2.vii.1900, in the meadows, *WW* (60); Kidbrooke, 11.ix.1897, sweeping nettles, *WW* (60).

Surrey. Wimbledon Common, 6.viii.41, *FJC* (64); Bookham Common, 20.viii.1894, under cut grass, *WW* (60); 18.ix.20, *FJC* (64); 30.vii.51 ♂ & ♀ and 5.viii.50 ♀, *DL* (64); West End Common, 9.viii.10, *WW* (60); and just beyond the boundary on Ranmore Common, 7.ix.54, *HDS* (LSR).

Nabis ferus (Linn.) p.82

Herts. Totteridge (Darland's Lake NR), 9.viii.84, *PK* (85).

Kent. Darenth Wood (TQ/57R), 18.viii.76 and (TQ/57Q), 7.ix.76, *KCS* (14); Joyden's Wood, 18.xi.75 (TQ/47V), *KCS* (14); Farningham Wood, (TQ/56), 7.ix.68, *KCS* (14).

Surrey. Mitcham Common, 26.ix.83, swept from grasses, *JAH* (91); Coulsdon, 15.v.62, 13.viii.64, 19.ix.64 and 21.ix.63, general sweeping, *HGD* (65); Caterham (Pilgrim Fort) (TQ/3453), 3.ii.68, in grass roots, *KCS* (14); Headley Lane, 1893, *WW* (60); Weybridge (Oatlands), vii.56, *HDS* (64); and just over the boundary at Wisley, 26.ix.11, sweeping round the small lake, *WW* (60); and beyond at Woking, 11.ix.33, *CRB* (LSR).

Nabis rugosus (Linn.) p.83

Essex. Epping Forest, 21.ix.32, on birch, *TRE* (60).

Kent. Darenth Wood (TQ/57R), 5.viii.76 and (TQ/57R), 10.viii.76, *KCS* (14); Bromley, 3.x.64, *PJC* (63); Orpington, 3.vi.65 *PJC* (63); Westerham, 4.x.70, *KCS* (14).

Surrey. Wimbledon Common, 26.vi.59, *DGH* (57); Purley, 9.ix.45, *JLH* (64); Coulsdon, 14.iv.61, 12. & 13.v.61 and 2.vi.61, general sweeping, *HGD* (65); Caterham (Pilgrim Fort) 21.ix.68 and 29.v.69, (TQ/3453), in vegetation on the scarp, *KCS* (14); Mickleham, 26.i.1896, *WJA* (64); Boxhill, 10.x.11, in the field, *WW* (60); on the boundary near Effingham, 1.vi.68, *PSB* (16); on Ranmore Common, 18.vi.05 and 13.iii.04, n.c. (64); Wisley, 26.ix.11, sweeping round the small lake, *WW* (60); and beyond at Chobham Common, 24.v.59, *DGH* (BDK); and Woking, 18., 21, 25, & 28.viii.33 and 11.ix.33, *CRB* (LSR).

Nabis ericetorum (Scholtz) p.84

Kent. Hayes Common, 13.ix.36, *DWR* (60).

Surrey. Richmond Park, 6.x.45, *FJC* (64); Shirley Common, 1.ix. & 20.x.1894, by sweeping heath, *WW* (60); Oxshott Heath, 16.x.50, *DL* (60); Esher Common, 1.ix.52 and 11.x.48, *FJC* (64); (Black Pond), 12.ix.48, *FJC* (64); Arbrook Common, 30.vi.52, *FJC* (64); and beyond the boundary on Albury Downs, 19.ix.31, *FJC* (64); Pyrford, 21.v.30, *FJC* (64); and Woking. 18. & 25.viii.33 and 4. & 9.ix.33, *CRB* (LSR).

Aptus mirmicoides (Costa) (Synonym: *Himacerus mirmicoides*) p.85

Essex. Grays Thurrock, 11.viii.79, *LJ* (77).

Kent. Darenth Wood (TQ/57R), 17.ix.76, *KCS* (14); Bromley, 12.viii.67, with a lacewing larva as prey, *PJC* (63); Shoreham, 25.viii.64, *KCS* (14).

Surrey. Purley, 7.ix.45, *JHL* (64); Coulsdon, 9.x.51 & 30.iv.61, general sweeping, *HGD* (65); Reigate, 3.ix.1898, by sweeping, *WW* (60); Mickleham, x.08 and vi.1896, *WJA* (64); Boxhill, 29.viii.1896, on birch *WW* (60); 28.vii.83, *K. Alexander* (pers. comm.); Fetcham, 9.viii.1897, *WJA* (64); Bookham Common, ix.1898, *WJA* (64); 27.viii.1896, under refuse, *WW* (60); Oxshott Heath, 1.x.51, *FJC* (64); Esher Common, 15.x.53 and 2.ix.50, *FJC* (64); (Black Hills), 15.x.51, *FJC* (64); West End Common, 10.ix.51, 11.ix.50, 25.viii.52, *FJC* (64); and on the boundary at Horsley, 13.vi.1897, *WJA* (64); and Byfleet, 12.viii.49, *FJC* (64).

Himacerus apterus (Fab.) p.87

Essex. Dagnam Park, 24.vii.79 and 13.ix.78, *DAS* (89); Grays Thurrock, 11.viii.79, *LJ* (77).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. West Wickham, 17.ix.1898, on pines, *WW* (60); Darenth Wood, 21.viii.04 and 31.ix.05, *WW* (60); (TQ/57R), 18.viii.76, *KCS* (14); Farningham Wood, 7.ix.68, *KCS* (14); Eynsford, 11.viii.34, *FJC* (64); Fawkham, 11.ix.54, *GGES* (HD); Downe, 2.ix.64, *PJC* (63).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 20.ix.83, beaten from oak, *JAH* (91); Ashtead, 15.viii.36 and 14.ix.47, *FJC* (64); 10.ix.38, *FDB* (64); Bookham Common, 16.viii.48 (V instar), 9.ix.35, 18.ix.30 ♂, and 28.ix.31, *FJC* (64) Esher Common, 23.x.51, *FJC* (64); Oxshott Heath, 22.vii.50 (V instar), *FJC* (64); West End Common, 21. &

29.vii.52 and 13.viii.51 (adult & V instar larva), *FJC* (64); and on the boundary at Byfleet, 12.ix.36, *FJC* (64); and beyond at Shere, 8.viii.63, V instar, *ECP-C* (RSM).

Anaptus major (Costa) (Synonym: *Stalia major*) p.88

Middx. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

Essex. Epping Forest, 16.ix.63, *PSB* (16); (Chingford), 19.ix.48, *DL* (64); Grays Thurrock, 11.viii.79, *LJ* (77); Dagnam Park, 3.vii.76 and 9.xi.76, *DAS* (89).

Kent. Lee (Hither Green Lane) 8.ix.1894, under hay-stack refuse, and 5.ix.1896, *WW* (60); Kidbrooke, 15.ix.1894, under refuse, *WW* (60); ix.11, sweeping in open spaces, *WW* (60); Bromley, 2.ix.67, *PJC* (63); Darenth Wood (TQ/57R), 7.ix.76, and (TQ/57Q), 7.ix.76, *KCS* (14); Chislehurst, ix.1900, *WJA* (64).

Surrey. Mitcham Common, 8.iii.53, *LC* (64); Wimbledon Common, 31.vii.56, *HDS* (64); near Leatherhead, x.1898, *WJA* (64); Bookham Common, viii.19, *WJA* (64); Oxshott Heath, 28.vii.57, *GGES* (HD); West End Common, 20.viii.51 and 23.x.51, *FJC* (64); Weybridge (Oatlands), vii.56, *HDS* (64); and beyond the boundary at Ranmore Common, 15.x.50, *FJC* (64); 7.ix., *HDS* (LSR); Horsell, 16.ix.31, *FJC* (64); and Woking, 19.vii.33, *CRB* (LSR).

Stalia boops (Schiödte) p.89

Surrey. Mitcham Common, ix.83, on grass, *JAH* (91); West End Common, 9.viii.08, *WW* (60).

Nabicula limbatus (Dahlb.) (Synonym: *Dolichonabis limbatus*) p.89

Essex. Stifford, 11.viii.79, *LJ* (77).

Herts. Totteridge (Darland's Lane N.R.), 9.viii.84, *PK* (85).

Kent. Darenth Wood (TQ/57R) 5.viii.76, and (TQ/57Q), 10.viii.76, *KCS* (14); Farningham Wood, 7.ix.68, *KCS* (14); Cuckoo Wood, near Downe, 2.x.66, *PJC* (63); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Wimbledon Common, 31.vii.56, *HDS* (64); Boxhill, 10.x.11 ♂ & ♀, in field, *WW* (60); 23.vii.80, *LJ* (77); Bookham Common, 18.ix.30 ♂, *FJC* (64); Oxshott Heath, 9.x.54, *HDS* (LSR); Esher Common, 15.ix.53, *FJC* (60); West End Common, 20.viii.50 ♂, 11.ix.50 ♂, and 5.x.50 ♀, *FJC* (64); Arbrook Common, 30.vi.52 ♂ & ♀, *FJC* (64); Weybridge (Oatlands), vii.56, *HDS* (64); and beyond the boundary on Ranmore Common, 30.vii.11, in the rides, *WW* (60); and at Woking, 4.vii.33, 18. & 28.viii.33, and 11.ix.33, *CRB* (LSR).

Anthocoris confusus (Reut.) p.93

Middx. Hampstead Heath, 8.vi.50, in clearing on sandy heath, *WJLeQ* (21).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 25.viii.54, *GGES* (HD).

Essex. Dagnam Park, 10.x.75 and 4.iii.78, *DAS* (89).

Kent. Darenth Wood (TQ/57R) & (TQ/57Q), 10.viii.76, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Hackbridge, 17.v.53, *LC* (64); Caterham (Pilgrim Fort), (TQ/3453), 29.v.69, *KCS* (14); Titsey (Botley Hill), 22.x.67, *PSB* (16); Mickleham, 10.i.1897, *WJA* (SL); and beyond the boundary at Woking, 29.v.33 & 20.vii.33, *CRB* (LSR); and Gomshall, 12.v.51, *HDS* (LSR).

Anthocoris simulans (Reut.) (Synonym: *A. minki* sensu auctt. brit.) p.95

Surrey. Richmond, viii.80, along Kew towpath, Vth instar larvae inside galls of *Pemphigus spirothecae* (Hom. Aphidae) on *Populus italica* (of which seven moulted to adults-3♂♂, 4♀♀), *VFE* (BM) (see L. Jessop, EMM **119** (1983): 221-223).

Anthocoris nemoralis (Fab.) p.95

Middx. Northwood, 8.x.43, *DT* (LSR); Chelsea Physic Garden, 2.vii.80, and 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 18. & 30.iv.76, 22.iv.78 and 28.v.77, *DAS* (89).

Kent. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Darenth Wood (TQ/57R), 5.viii.76, and (TQ/57Q), 18.viii.76, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, 17.iii.03, n.c., (SL); Mitcham Common, 11.v.80 and 23.vi.80, *LJ* (77); Hackbridge, 6.vii.52, *LC* (64); Coulsdon, 6.v.61, *HGD* (65); Boxhill, 4. & 8.vii.40, *FJC* (SL); 23.vii.80, *LJ* (77); Ashtead, 12.v.51, *FJC* (SL); Bookham Common, 1.vii.49 and 15.vii.49, *FJC* (SL); Oxshott Heath, 2.x.31, *FJC* (SL); v.1896, *WJA* (SL); Esher Common, 30.iv.51 and 19.ix.51, *FJC* (SL); West End Common, 19.vii.54 and 17.vii.54, *FJC* (SL); Arbrook Common, 13.v.52 and 8.xi.32, *FJC* (SL); Ockham Common, 22.vii.49, *FJC* (SL); 27.v.61, *HGD* (65); Weybridge (Oatlands), 15.x.54, *HDS* (LSR); and just over the boundary at Effingham, 7.iv.34 and 11.iv.36, *FJC* (SL); Ranmore Common, 16.vi.05, n.c. (SL); and beyond at Woking, 10.vii.33, *CRB* (LSR); (St Johns) 25.viii.33, *CRB* (LSR); and Horsell Common, 16.iv.38, *FJC* (SL).

Anthocoris butleri LeQuesne p.96

Kent. Blackheath, 18.ix.57, *AMM* (HD).

Surrey. Boxhill, 20.vii.58 and 23.viii.58, *AMM* (HD).

Anthocoris sarothamni D. & S.

Kent. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Darenth Wood (TQ/57R), 17.ix.76, *KCS* (14).

Anthocoris nemorum (Linn.) p.98

Middx. Chelsea Physic Garden, 2.vii.80, and 4.viii.81 (several examples), *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 16.iii.81 and 12. & 16.iv.77, *DAS* (89).

Kent. Kidbrooke, 1893, *WW* (SL); Hayes Common, 13.ix.36, *DWR* (SL); Darenth Wood (TQ57R), 5.viii.76, *KCS* (14); Farningham Wood (TQ/56), 7.ix.68, *KCS*; Fawkham, 22.vii.56, *GGES* (HD); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14); Downe, 10.vi.67, on Darwin's Bank, *KCS* (14); Chislehurst, 2.ix.67, *PJC* (63); Bromley, 2.ix.67, *PJC* (63).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, 3.viii.32, *FJC* (SL); 23.v.54, *HDS* (LSR); Mitcham Common, 9.ix.79, *LJ* (77); 19. & 20.ix.83, (beaten from oak-hawthorn scrub), 26.ix.83 (on sallow), 28.ix.83 (on poplar), and 4.x.83, *JAH* (91); Hackbridge, 6.vii.52, *LC* (64); Beddington, 9.ix.79, *LJ* (77); Coulsdon, 6.v.61, 17.v.65, 24.v.63, 2.vi.63 and 12.xi.61, *HGD* (65); Caterham (Pilgrim Fort), 21.ix.68 and 9.v.70, *KCS* (14); Crohamhurst, 23.iv.21, n.c. (SL); Shirley Common, 14.ix.1895, on birch, *WW* (SL); Boxhill, 23.vii.80, *LJ* (77); West Humble, 7.v.79, *LJ* (77); Mickleham, 3.v.1896, *WJA* (SL); Bookham Common, 11.viii.32, *FJC* (SL); 2.iv.38, *FDB* (SL); 18.ix.31, *FJC* (SL); Oxshott Heath, 7.vii.1895, *WJA* (SL); 15.vii.53, *FJC* (SL); 9.x.54, *HDS* (LSR); Esher Common, 31.v.32, *FJC* (SL); Arbrook Common, 3.vi.32, *FJC* (SL); Weybridge (Oatlands), 13.iv.55, *HDS* (LSR); on the boundary at Byfleet, 2.vii.32, *FJC* (SL); Ranmore Common, 15.ix.32, *FJC* (SL); and beyond at Woking, 30.vi.33 and 11.vii.33, *CRB* (LSR); (Knaphill), 16.ix.33, *CRB* (LSR); Pyrford, 19.ix.34, and 19.x.32, *FJC* (SL).

Tetraphleps bicuspis (H.-S.) p.100

Surrey. Shirley, 3.vi.09, *HStJKD* (HD).

Acompocoris pygmaeus (Fall.) p.101

Kent. Fawkham, 12.ix.54, *GGES* (HD).

Orius majusculus (Reut.)

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. Darenth Wood (TQ/57R), 5.x.76, *KCS* (14).

Surrey. Beyond the boundary at Woking (Knaphill), 16.ix.33, *CRB* (LSR).

Orius vicinus (Ribaut)
(Synonym: *Orius minutus* sensu auctt. brit. nec Linn, 1758) p.102

Middx. Chelsea Physic garden, 2.vii.80 and 4.viii.81 (many examples), *BNKD* (88), Hammersmith (Scrubs Wood), 1984, on railway land, *WD, BJ & EJ* (92).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 28.ix.83, on sallow, *JAH* (91).

Orius niger subsp. *compressicornis* (Sahl.) p.103

Middx. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Surrey. Mitcham Common, 9.ix.79, *LJ* (77); Oxshott Heath, 8.viii.1891, *AJC* (HD), and beyond the boundary at Woking, 28.viii.33 and 7.ix.33, *CRB* (LSR); (Knaphill), 16.ix.33, *CRB* (LSR).

Lyctocoris campestris (Fab.) p.104

Kent. Blackheath, 10.ix.1898, on poplar, *AB* in *AJC* coll. (HD); Bromley, 21.xi.64, *PJC* (63); and Farningham Wood, 7.ix.68, *KCS* (14).

Xylocoris cursitans (Fall.) p.106

Kent. Just on the boundary at Sevenoaks, 4.iv.37, *ARW* (RSM).

Cimex lectularis (Linn.) subsp. *lectularis* p.109

London. (Without precise locality) per Modern Vermin Service, v.53, *LC* (64).

Surrey. Putney, 4.vi.29, *HStJKD* (HD); Leatherhead, vii.19, *WJA* (64).

Loricula elegantula (Baer.) p.112

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Surrey. Richmond Park, iv.-x.84, *WRD* (93).

Myrmedobia distinguenda Reut. p.113

Surrey. Richmond Park, iv.-x.84, *WRD* (93).

Monalocoris filicis (Linn.) p.115

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. Darenth Wood (TQ/57R), 5.viii.76 and (TQ/57Q), 10.viii.76, *KCS* (14); Farningham Wood, 7.ix.68, *KCS* (14).

Surrey. Oxshott Heath, 4.ix.51, *HDS* (LSR); and beyond the boundary at Woking, 21.viii.32, 4.vii.33, 5. & 18.viii.33 and 7.ix.35, *CRB* (LSR).

Deraeocoris lutescens (Schill.) p.117

Middx. Chelsea Physic Garden, 2.vii.80, *BNKD* (88); Hammersmith (Scrubs Wood), 1984, on railway land, occurring on oak, sycamore and birch, *BJ & EJ* (92).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Grays, 11.viii.79, *LJ* (77); Dagnam Park, 9.iv.77 and 14.vii.76, *DAS* (89).

Kent. Bromley, 16.vi.66, *PJC* (63).

Surrey. Richmond Park, iv.x.84, *WRD* (93); Wimbledon Common, 8.ix.51 and v.53, *HDS* (LSR); Mitcham Common, 11.v.80, 2.ix.79 and 9.ix.79, *LJ* (77); 19. & 20.ix.83 (beaten from oak-hawthorn habitat), 27.ix.83; 21.x.83 (under bark) and 25.x.83, *JAH* (91); Oxshott Heath, 4.ix.51, *HDS* (LSR).

Deraeocoris ruber (Linn.) p.118

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Epping Forest, 21.ix.32, on birch, *TRE* (64); Stifford, 11.viii.79, *LJ* (77); Dagnam Park, 3.vii.76 and 7.viii.77, *DAS* (89); and Cranham, 21.vii.76, *DAS* (89).

Kent. Bromley, 16.vi.66, *PJC* (63); Darenth Wood (TQ/57Q), 10.vii.76 and 10.viii.76, *KCS* (14).

Surrey. Wandsworth Common, 3.viii.54 ♂ & ♀, *DGH* (BDK); Hackbridge, 6.vii.52 ♀, 28.vii.53 and 19.viii.52, *LC* (64); 9.vii.52 ♂ and 12.viii.53 ♀ *JC* (64); Chipstead, 1.viii.60 ♂, general sweeping, *HGD* (65); Oxshott Heath, 18.vii.53, *HDS* (LSR); Esher Common, 27.vii.51, *HDS* (LSR); Ockham Common, 23.vii.60 ♀, general sweeping, *HGD* (65); and beyond the boundary at Woking, 4., 10., & 18.vii.33, *CRB* (LSR); (St. John's), 21.viii.33, *CRB* (LSR); and Gomshall, 28.vii.51, *HDS* (LSR).

Deraeocoris scutellaris (Fab.) p.120

Surrey. Beyond the boundary at Gomshall, 17.vii.43, *HDS* (LSR).

Deraeocoris olivaceus (Fab.) p.120

Bucks. Langley Park, 26.vi.55, PH (HD).

Alloeotomus gothicus (Fall.) p.121

Surrey. Richmond Park, iv.-x.84, *WRD* (93).

Lopus decolor (Fall.) p.121

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 23.vii.76, *DAS* (89).

Oncotylus viridiflavus (Goeze) p.122

Surrey. Beyond the boundary at Woking, 27. & 30.vi.33, 4.vii.33, 25.viii.33 and 7.ix.33, *CRB* (LSR); (St John's), 18. & 21.viii.33, *CRB* (LSR).

Megalocoleus molliculus (Fall.) p.125

Middx. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Megalocoleus pilosus (Schrank) p.125

Essex. Stifford, 11.viii.79, *LJ* (77).

Surrey. Mitcham Common, ix.83, on grass, *JAH* (91); and beyond the boundary at Shere, n.d., *ES* (RSM).

Amblytylus nasutus (Kb.) p.126

Kent. Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14); Chislehurst (TQ4369), 30.vi.68, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Orthonotus rufifrons (Fall.) p.129

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 29.vii.55, *GGES* (HD).

Essex. Dagnam Park, 3.vii.76, *DAS* (89).

Harpocera thoracica (Fall.) p.129

Herts. Totteridge (Darland's Lake N.R.), 2.vi.84, near West pond, *JHB* (85).

Essex. Dagnam Park, 23.v.82, 24.v.77, and 14.vi.76, *DAS* (89).

Kent. Bromley, 16.vi.66, *PJC* (63).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Caterham (Pilgrim Fort), (TQ/3453), 29.v.69, *KCS* (14); and Esher Common (Black Pond), 22.v.50, *FJC* (64).

Phylus palliceps Fieb. p.132

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Boxhill, 23.vii.79, *LJ* (77); and beyond the boundary at Woking, 22.vi.33, *CRB* (LSR).

Phylus melanocephalus (Linn.) p.132

Herts. Beyond the boundary at Harpenden, 1.viii.54, *GGES* (HD).

Essex. Dagnam Park, 19.vi.76, *DAS* (89).

Kent. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, i.vii.79, *LJ* (77); Boxhill, 23.vii.79, *LJ* (77); and beyond the boundary at Woking, 22.vi.33, *CRB* (LSR).

Phylus coryli Linn. p.133

Kent. Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Boxhill, 23.vii.79, *LJ* (77).

Psallus betuleti (Fall.) p.135

Middx. Hampstead Heath, 26.vi.58, *DL* (64).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Bookham Common, 6.vii.35, *FJC* (64); and beyond the boundary at Woking, 22.vi.33, *CRB* (LSR).

Psallus ambiguus (Fall.) p.136

MIDDX. Hampstead Heath, 26.vi.58, on *Crataegus*, *DL* (64).

ESSEX. Dagnam Park, 12.vii.76, *DAS* (89).

KENT. Chislehurst (TQ4469), 30.vi.68 ♂, *KCS* (14).

Psallus perrisi Wagner p.137

HERTS. Hatfield, 7.vi.64, *PLJR* (20).

ESSEX. Dagnam Park, 5.vi.76 and 19.vi.76, *DAS* (89).

KENT. Darenth Wood (TQ57R), 22.vi.77, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 22.vi.79, *LJ* (77).

Psallus wagneri Ossian. p.137

SURREY. Richmond Park, iv.-x.84, *WRD* (93).

Psallus variabilis (Fall.) p.138

SURREY. Ashtead, 15.vi.48, *FJC* (64); West End Common, 9.vii.51, *FJC* (64); Arbrook Common, 16.vi.52, *FJC* (64); Ockham Common, 12.vi.39, *FJC* (64); 27.v.61, *HGD* (65); on the boundary at Byfleet, 29.v.49 and vii.49, *FJC* (64); and beyond at Bookwood, 4.vi.39, *FJC* (64).

BUCKS. Beyond the boundary at High Wycombe, 5.vi.38, *FDB* (64).

Psallus quercus (Kb.) p.138

KENT. Lewisham, 14.viii.1891, *AJC* (HD).

Psallus haematodes (Gmel.) (Synonym: *Psallus roseus* (Fab.)) p.139

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85)).

SURREY. Boxhill, 3.viii.18, *WJA* (64); West End Common, 13.viii.51 and 10.ix.51, FJC (64).

Psallus lepidus Fieb. p.140

MIDDX. Hampstead Heath, 26.vi.58, on *Fraxinus*, *DL* (64).

HERTS. Elstree, 3.vii.56, on *Fraxinus*, *DL* (64).

SURREY. Beyond the boundary at Woking, 22.vi.33, *CRB* (LSR).

Psallus falleni Reut. p.140

SURREY. Richmond Park, iv.-x.84, *WRD* (93); and beyond the boundary at Woking, 4.ix.3, *CRB* (LSR).

Psallus scholtzii Fieb. (Synonym: *Psallus alnicola* D. & S.)) p.141

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Psallus diminutus (Kb.) p.141

SURREY. Richmond Park, iv.-x.84, *WRD* (93).

Psallus albicinctus (Kb.) p.142

SURREY. Richmond Park, iv.-x.84, *WRD* (93).

Psallus varians (H.-S.) p.142

MIDDX. Hampstead Heath, 30.vi.58, on *Quercus robur*, *DL* (64).

HERTS. Hatfield, 6.vi.64, *PLJR* (20); and beyond the boundary at Harpenden, 7.vii.54, *GGES* (HD).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Wimbledon Common, 2. & 22.vi.48, *FJC* (64); Mitcham Common, 16.vi.79 and 22.vi.79, *LJ* (77); Ashtead Common, 15.vi.48, 21.vi.47 and 11.vii.47, *FJC* (64); Esher Common, 29.vi.53, *FJC* (64); Arbrook Common, 3.vi.48, 8.vi.52 and 30.vi.52, *FJC* (64); on the boundary at Byfleet, iv.49 and 2.vii.38, *FJC* (64); and beyond at Woking, 29.v.33, *CRB* (LSR).

Phoenicocoris obscurellus (Fall.) p.143

KENT. Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Compsidolen salicellus (H.-S.) (Synonym: *Coniortodes salicellus*) p.144

KENT. Darenth Wood (TQ/57Q), 18.viii.76, *KCS* (14); Farningham Wood, 7.ix.68, *KCS* (14).

SURREY. Boxhill, 15.vii.1893, *AJC* (HD); and beyond the boundary at Chobham Common, 29.vii.1892, *AJC* (HD).

Atractotomus mali (Mey.-Dür) p.146

ESSEX. Dagnam Park, 14.vii.76 and 7.viii.77, *DAS* (89).

KENT. Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Atractotomus magnicornis (Fall.) p.147

HERTS. Beyond the boundary at Harpenden, 29.vii54, *GGES* (HD).

SURREY. Beyond the boundary at Woking, 15. & 18.vii.33, *CRB* (LSR).

Plagiognathus albipennis (Fall.) p.148

HERTS. St. Albans, 29.viii.64, *PLJR* (20).

KENT. Darenth Wood (TQ/57Q), 10.viii.76, *KCS* (14).

SURREY. Mitcham Common, 1.vii.79, *LJ* (77).

Plagiognathus arbustorum (Fab.) p.148

MIDDX. Chelsea Physic Garden, 2.vii.80 and 4.viii.81 (many examples), *BNKD* (88); Hammersmith (Scrubs Wood), 1984, on railway land, occurring on thistle and willowherb, *BJ & EJ* (92).

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Stifford, 11.viii.79, *LJ* (77); Dagnam Park, 19.vi.76, 9.vii.77 and 22.vii.80, *DAS* (89).

KENT. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14); Chislehurst (TQ/4369), 30.vi.68, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

SURREY. Mitcham Common, 2.iv.79, *LJ* (77); Hackbridge, 14.vii.79, *LJ* (77); Coulsdon, 11.viii.63, sweeping *Aster* sp. (garden aster) in garden in Fryston Avenue, *HGD* (65); Boxhill, 23.vii.80, *LJ* (77); and beyond the boundary at Woking, 27. & 30.vi.33, 4. & 11.vii.33 and 18.viii.33, *CRB* (LSR).

Plagiognathus chrysanthemi (Wolff) p.150

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Stifford, 11.viii.79, *LJ* (77).

KENT. Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Chlamydatus pullus (Reut.) p.152

HERTS. St Albans, 29.viii.64, *PLJR* (20).

Campylomma verbasci (Mey.-Dür) p.153

MIDDX. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

Salicarus roseri (H.-S.) p.154

KENT. Blackheath, 25.vii.1899, *AB* in *AJC* coll. (HD).

Sthenarus rotermundi (Scholtz) p.155

KENT. Darenth Wood (TQ/57Q), 2.viii.81, *EPh* (91).

Asciodema obsoletum (Fieb.) p.155

MIDDX. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

KENT. Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14).

SURREY. Mitcham Common, 17.ix.83, on gorse, *JAH* (91).

Hallodapus rufescens (Burm.) p.157

SURREY. Beyond the boundary at Woking, viii.1888, *ES* (HD).

Systellonotus triguttatus (Linn.) p.157

Kent. Beyond the boundary at Eccles (Gt Culand Pit) (TQ/7361), 25.vi.66, on the ground, *KCS* (14).

Surrey. Boxhill, 18.vii.37 and 29.vii.37, *ECB* (HD).

Macrolophus rubi (Woodroffe) p.158

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Neodicyphus rhododendri (Dolling) New record

Occasional. This elongate grey mirid was first noticed on various species of *Rhododendron* (mainly *R. ponticum*) in southern England during June and July, 1971. First described under the name *Dicyphus rhododendri* by W. R. Dolling in 1972 (EMM **107,** 244-5), this alien seems to have established itself and be spreading within the counties around London. It is most closely related to the N. American *Dicyphus agilis*.

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Surrey. Kew Gardens, 2.viii.71 ♂, on *Rhododendron* sp., *VFE* (BM **Holotype**) (EMM **107** (1971), 244-5, published 1972).

Bucks. Slough, *GEW* (BM).

Dicyphus constrictus (Boh.) p.159

Surrey. Coulsdon, 21.x.71, *KCS* (14).

Dicyphus epilobi (Reut.) p.159

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Dicyphus errans (Wolff) p.160

Middx. Chelsea Physic Garden, 2.vii.80 and 4.viii.81 (many examples), *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Coulsdon, 16.vii.65, in greenhouse of garden in Fryston Avenue, *HGD* (65); and just over the boundary at Ranmore Common, 7.ix.54, *HDS* (LSR).

Dicyphus stachydis (Reut.) p.161

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 4.v.76, *DAS* (89).

Dicyphus pallicornis (Mey-Dür) p.162

Middx. Chelsea Physic Garden, 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Surrey. Merton Park, 2.viii.35, *FJC* (LSR).

Dicyphus annulatus (Wolff) p.163

Surrey. Just over the boundary on Ranmore Common, 7.ix.54, *HDS* (LSR).

Dicyphus globulifer (Fall.) p.163

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 16. & 30.iv.77, *DAS* (89).

Campyloneura virgula (H.-S.) p.164

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 12.viii.77, *DAS* (89).

Kent. Lullingstone, 4.vii.70, in Beechen Wood, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); and beyond the boundary at Woking, 19. & 20.vii.33, *CRB* (LSR).

Pilophorus clavatus (Linn.) p.166

Essex. Grays, 11.viii.79, *LJ* (77).

Surrey. Beyond the boundary at Chobham, 2.viii.1895, *AJC* (HD).

Orthocephalus coriaceus (Fab.) p.169

HERTS. Beyond the boundary at Harpenden, 27.vi.55 and 5.vii.55, *GGES* (HD).

Malacoris chlorizans (Panz.) p.170

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (HD); and beyond the boundary at Harpenden, 5. & 7.ix.54, *GGES* (HD).

KENT. Darenth Wood (TQ/57R), 5.viii.76 and (TQ/57Q), 18.viii.76, *KCS* (14).

Cyllecoris histrionicus (Linn.) p.172

ESSEX. Dagnam Park, 12. & 19.vi.76, *DAS* (89).

KENT. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Darenth Wood, (TQ/57Q), 22.vi.77, *KCS* (14); Lullingstone Park, 4.vii.70, in Beechen Wood, *KCS* (14).

SURREY. Richmond Park, iv.x.84, *WRD* (93); Mitcham Common, 16.vii.79, *LJ* (77); Banstead, 16.vi.1900, *SL* (1/**1900**, 14); Boxhill, 23.vii.80, *LJ* (77).

Dryophilocoris flavoquadrimaculatus (De Geer) p.173

ESSEX. Epping Forest, 20.vi.64, *PLJR* (20); The Oak, SW of South Weald, 25.v.76, *DAS* (89); South Weald, 25.v.76, *DAS* (89); Brentwood, vi.79, *DAS* (89); Dagnam Park, 2.vi.79, *DAS* (89).

KENT. Darenth Wood (TQ/57Q), 22.vi.77, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Banstead, 16.vi.1900, *SL* (1/**1900**, 14 as *Cyllecoris flavonotatus*).

Heterocordylus tibialis (Hahn) p.175

KENT. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Darenth Wood (TQ/57R), 22.vi.77, *KCS* (14).

Heterotoma planicornis (Fall.) p.176

MIDDX. Chelsea Physic Garden, 4.viii.81, many examples, *BNKD* (88).

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 12.viii.55, *GGES* (HD).

ESSEX. Grays, 11.viii.79, *LJ* (77); Stifford, 11.viii.79, *LJ* (77); Dagnam Park, 7.viii.77, *DAS* (89).

KENT. Darenth Wood (TQ/57Q), 2.viii.81, *EPh* (91).

SURREY. Coulsdon, 27.vii.57, *DGH* (BDK).

Blepharidopterus angulatus (Fall.) p.178

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 22. & 30.viii.54, *GGES* (HD).

ESSEX. Grays, 11.viii.79, *LJ* (77).

KENT. Darenth Wood (TQ/57R), 10.viii.76 and (TQ/57Q), 18.viii.76, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93), Mitcham Common, 2.ix.79, *LJ* (77).

Pachylops bicolor (D. & S.) p.179

SURREY. Oxshott Heath, 11.x.1893, *AJC* (HD).

Orthotylus tenellus (Fall.) p.181

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

SURREY. Richmond Park, iv.x.84, *WRD* (93).

Orthotylus marginalis (Reut.) p.182

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 26.vii.55, *GGES* (HD).

SURREY. Mitcham Common, 8.vii.79, *LJ* (77).

Orthotylus flavinervis (Kb.) p.183

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Orthotylus nassutus (Fab.) p.184

MIDDX. Hammersmith (Scrubs Wood), 1984, on railway land, occurring on sycamore, *BJ & EJ* (92).

Kent. Lewisham, 1.x.1877, on white poplar, *ES* (HD).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); and beyond the boundary at Chobham, viii.1874, on oaks, *ES* (HD).

Orthotylus ochrotrichus Fieb. p.185

Middx. Chelsea Physic Garden, 4.viii.81, *BNKD* (88).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Orthotylus prasinus (Fall.) p.186

Kent. Kidbrooke, 6.viii.1898, on elm, *WW* (HD).

Orthotylus adenocarpi (Perr.) p.188

Middx. Chelsea Physic Garden, 2.vii.80, *BNKD* (88).

Essex. Stifford, 11.viii.79, *LJ* (77).

Kent. Dartford Heath, (TQ/57B), 29.vi.75, *KCS* (14).

Surrey. Mitcham Common, 12.ix.83, on broom, *JAH* (91).

Orthotylus virescens (D. & S.) p.189

Essex. Stifford, 11.viii.79, *LJ* (77).

Kent. Darenth Wood (TQ/57R), 10.viii.76, *KCS* (14).

Surrey. Mitcham Common, 9.ix.79, *LJ* (77).

Orthotylus bilineatus (Fall.) (Synonym *Neomocomma bilineatus* (Fall.)). p.195

Surrey. Wimbledon Common, viii.1880, *ES* (HD); Mitcham Common, 26.ix.83, on poplar, *JAH* (91).

Pseudoloxops coccineus (Mey-Dür) p.194

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Mecomma ambulans (Fall.) p.196

Surrey. Boxhill, 23.vii.32 ♂, *FJC* (SL); 23.vii.79, *LJ* (77); West End Common, 12.vi.48 and 9.vii.51, *FJC* (SL).

Pithanus maerkeli (H.-S.) p.199

Essex. Dagnam Park, 26.viii.79, *DAS* (89).

Lygus maritimus (Wagner) p.200

Middx. Heston, 16.ix.43 ♀, *HStJKD* (HD).

Kent. Darenth Wood (TQ/57R), 5.x.76, *KCS* (14).

Lygus rugulipennis (Popp.) p.201

Essex. Grays Thurrock, 6.v.80, *LJ* (77).

Kent. Darenth Wood, (TQ/57R) 5.viii.76 & 18.viii.76, and (TQ/57Q) 7.ix.76, *KCS* (14); Eynsford, 11.viii.34 and 15.viii.37, *FJC* (64).

Surrey. Wimbledon Common, 27.iv.30 and 11.v.20 (on sallow), *FJC* (64); Mitcham Common, 7.ix.79 and 11.v.80, *LJ* (77); Coulsdon, 5.v.60, general sweeping, *HGD* (65); Mickleham, 19.x.47, *FJC* (64); x.1898, *WJA* (64); Boxhill, 30.viii.48, 24.iv.48 and 2.x.37, *FJC* (64); Claygate, 23.viii.18, n.c., (64); Ashstead Common, 13.ix.48, 14.ix.47, 30.ix.48, 2.ix.46, 11.vi.47 and 15.viii.46, *FJC* (64); Bookham Common, 16.viii.46, 18.ix.30, 28.ix.37, and 2.x.32, *FJC* (64); Oxshott Heath, 8.xi.35, on pine, *FJC* (64); Esher Common, 25.ix.51, 4.x.48 and 29.x.51, *FJC* (64); Ockham Common, 8.xi.35, *FJC* (64); West End Common, 28.viii.50 and 11.x.50, *FJC* (64); on the boundary at Wisley, 12.iv.48, *FJC* (64); Byfleet, 8.ix.41 and 12.viii.49, *FJC* (64); and beyond at Pyrford, 19.x.22, *FJC* (64); Horsell, 1.vi.34, on pines, *FJC* (64) and on Albury Downs, 1.ix.31 and 19.ix.31, *FJC* (64).

Liocoris tripustulatus (Fab.) p.203

Middx. Cripplegate bombed sites, City of London, 23.iv.55, *DGH* (BDK); Chelsea Physic Garden, 2.vii.80 and 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Stifford, 11.viii.79 and 6.v.80, *LJ* (77); Dagnam Park, 4. & 14.v.76, 26.vi.76, 3.vii.76 and 4.ix.76, *DAS* (89); South Weald, 25.v.76, *DAS* (89).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Surrey. Coombe, 28.vii.35, *FJC* (64); Mitcham Common, 9.ix.79, *LJ* (77); ix.83, from grass, *JAH* (91); Hackbridge, 6.v.53, 17.viii.53 and 21. & 23.iii.53, *JC* (64); 14.vii.79, *LJ* (77); Coulsdon, 5.v.60, 24.v.63, and 26.vii.64, by general sweeping, *HGD* (65); Reigate, 8.vii.50, on *Stachys sylvatica, GBR* (45).

Orthops cervinus (H.-S.) p.206

Middx. Hammersmith (Scrubs Wood), 1984, on railway land, found on birch, *BJ & EJ* (92); Chelsea Physic Garden, 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 26. & 30.viii.54, *GGES* (HD).

Surrey. Richmond Park, iv.-ix.84, *WRD* (93).

Orthops campestris (Linn.) p.208

Middx. Chelsea Physic Garden, 2.vii.80 and 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 14.viii.76, *DAS* (89).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Surrey. Mitcham Common, 2.vii.79, *LJ* (77); ix.83, from grass, *JAH* (91); Hackbridge, 9.vii.52, *LC* (64); Bookham Common, 29.vii.50 and 3.viii.58, *DL* (64).

Lygocoris pabulinus (Linn.) p.210

Middx. Chelsea Physic Garden, 2.vii.80 and 4.viii.81, *BNKD* (88).

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Essex. Dagnam Park, 2.vii.77, 10.vii.76 and 4.ix.76, *DAS* (89).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Lygocoris viridis (Fall.) p.212

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Kent. Lewisham, 19.viii.1891, *AJC* (HD).

Surrey. Mitcham Common, 8.vii.79 and 9.ix.79, *LJ* (77).

Lygocoris contaminatus (Fall.) p.214

Middx. Stanmore Common, 16.vii.82, *LJ* (77).

Essex. Grays Thurrock, 11.viii.79, *LJ* (77).

Surrey. Richmond Park, iv.-x.84, *WRD* (93).

Lygocoris spinolai (Mey.-Dür) p.216

Herts. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 12.viii.55, *GGES* (HD).

Essex. Dagnam Park, 3. & 10.vii.76, *DAS* (89).

Kent. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Surrey. Mitcham Common, ix.83, from grass, *JAH* (91).

Lygocoris lucorum (Mey.-Dür) p.216

Surrey. Hackbridge, 4.viii.52, *JC* (64).

Polymerus nigritus (Fall.) p.220

Essex. Dagnam, 26.vi.76, *DAS* (89).

Charogochilus gyllenhalli (Fall.) p.221

Herts. Beyond the boundary at Harpenden, 1.ix.54, *GGES* (HD).

Miris striatus (Linn.) p.222

Surrey. Richmond Park, iv.x.84, *WRD* (93).

Calocoris quadripunctatus (Villiers) p.223

Essex. Dagnam Park, 6.vi.79, *DAS* (89); Noak Hill, 8.vi.77, *DAS* (89).

Kent. Darenth Wood (TQ/57Q), 22.vi.77, *KCS* (14).

Surrey. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 16.vi.79, *LJ* (77).

Calocoris stysi (Wagner) (Synonym: *Calocoris sexguttatus* (Fab.)) p.224

MIDDX. Edgeware (Scratch Wood), 16.vii.55, *DGH* (BDK).

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

KENT. Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14).

Calocoris norvegicus (Gmel.) p.226

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Grays Thurrock, 11.viii.79, *LJ* (77); Dagnam Park, 26.vi.76, *DAS* (89).

KENT. Darenth Wood (TQ/57R), 17.vii.74 and 23.vii.77, *KCS* (14).

SURREY. Mitcham Common, 1.vii.79, *LJ* (77); Hackbridge, 14.vii.79, *LJ* (77).

Adelphocoris lineolatus (Goeze) p.228

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Stifford, 11.viii.79, *LJ* (77); Cranham, 21.vii.76, *DAS* (89).

SURREY. Mitcham Common, 7.x.51, *LC* (64); Hackbridge, 25.vii.51, *LC* (64); Bookham Common, 3.viii.58, *DL* (64).

Megacoelum infusum (H.-S.) p.229

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 14.vii.76, *DAS* (89).

KENT. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

SURREY. Denmark Hill (Ruskin Park). S.E.5, 13.vii.51 and 12.viii.51, on *Quercus cerris*, *SW* (44); Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 19., 20. & 27.ix.83, beaten from oak, *JAH* (91); Beddington, 9.ix.79, *LJ* (77); Oxshott, 11.x.1893, *AJC* (HD).

Megacoelum beckeri (Fieb.) p.230

SURREY. Wandsworth, ix.1877, *ES* (HD); Weybridge, 26.viii.19, *HStJKD* (HD).

Stenotus binotatus (Fab.) p.230

ESSEX. Dagnam Park, 26.vi.76 and 7.viii.77, *DAS* (89).

SURREY. Mitcham Common, 2.ix.79, *LJ* (77); 7.ix.83, from grass, *JAH* (91); Hackbridge, 14.vii.79, *LJ* (77); Boxhill, 23.vii.80, *LJ* (77); and just over the boundary at Outwood Common (TQ/3551), 20.viii.66, sweeping near pond, *KCS* (14).

Phytocoris tiliae (Fab.) p.232

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 10. & 14.vii.76, *DAS* (89).

KENT. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 2.ix.79, *LC* (77), 19. & 20.ix.83, on oak, *JAH* (91); Hackbridge, 6.vii.52, *LC* (64).

Phytocoris dimidiatus (Kb.) p.234

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

KENT. Lewisham, 20.vii.1891, *AJC* (HD).

SURREY. Richmond Park, 18.vi.08, *AJC* (HD); iv.-x.84, *WRD* (93); Coulsdon, 21.viii.64, *HGD* (65).

Phytocoris longipennis Flor. p.235

HERTS. Beyond the boundary at Harpenden, 22.viii.54, *GGES* (HD).

SURREY. Richmond Park, iv.-x.84, *WRD* (93); Mitcham Common, 9.ix.79, *LJ* (77).

Phytocoris reuteri Saunders p.235

SURREY. Richmond Park, iv.-x.84, *WRD* (93).

Phytocoris ulmi (Linn.) p.236

MIDDX. Hammersmith (Scrubs Wood), 1984, on railway land, found on blackberry, *BJ & EJ* (92).

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Stifford, 11.viii.79, *LJ* (77).

KENT. Darenth Wood (TQ/57R) 5.viii.76, *KCS* (14); (TQ/57Q) 7.ix.76, *KCS* (14).

SURREY. Mitcham Common, 2.ix.79, *LJ* (77).

Phytocoris varipes Boh. p.237

HERTS. Whippendell Wood, 27.vii.58, n.c. (64); Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

SURREY. Merton Park, 5.vii.48, *FJC* (64); Mitcham Common, 7.ix.83, from grass, *JAH* (91); Coulsdon, 28.ix.57, *DGH* (BDK); Mickleham, 6.x.15, *WJA* (64); 7.x.56, *DGH* (BDK); Bookham Common, 15.vii.49, *FJC* (64); Oxshott Heath, ix.51, *FJC* (64); Esher Common, 15.ix.53, *FJC* (64); West End Common, 20.viii.51, *FJC* (64); just over the boundary at Byfleet, 17.viii.38, *FJC* (64); and beyond at Effingham, 28.ix.37, *FJC* (64).

Capsus ater (Linn.) p.239

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 12. & 19.vi.76, *DAS* (89).

SURREY. Coulsdon, 18.vi.60, general sweeping, *HGD* (65); (Farthing Downs), 9.vii.58, general sweeping, *HGD* (65); Boxhill, 28.vii.83, *K. Alexander* (pers. comm.); Leatherhead, 22.vii.20, *FJC* (64); Bookham Common, 8.vii.56, *DGH* (BDK); West End Common, 30.vii.51, *FJC* (64); Arbrook Common, 30.vi.52 and 3.vi.40, *FJC* (64).

Pantilius tunicatus (Fab.) p.240

HERTS. Hoddesdon, 6.ix.32, *TRE* (64); Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

Capsodes gothicus (Linn.) p.241

SURREY. Bookham Common, 8.vii.51, *DGH* (BDK).

Stenodema calcaratum (Fall.) p.242

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 23.vii.76 and 5.x.76, *DAS* (89).

SURREY. Mitcham Common, 2.ix.79, *LJ* (77); 26. & 27.ix.83, on grass, *JAH* (91); Bookham Common, 15.viii.53, *JC* (64).

Stenodema laevigatum (Linn.) p.244

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85); and beyond the boundary at Harpenden, 21.vii.54, *GGES* (HD).

KENT. Darenth Wood (TQ/57R), 5.viii.76, and (TQ/57Q), 10.viii.76, *KCS* (14).

SURREY. Tooting Common, 13.v.79, *LJ* (77); Mitcham Common, 9.ix.79, *LJ* (77); 7.ix.83, from grass, *JAH* (91); Coulsdon, 12.v.61, taken at night by general sweeping in Warwick Road, *HGD* (65); (Farthing Downs), 24.v.63, on nettle, *HGD* (65); Banstead Downs, 30.v.54, *LC* (64); Bookham Common, 18.ix.56, *FJC* (64); Boxhill, 18.vi.39, *FJC* (64); beyond the boundary at Albury Downs, 19.ix.31, *FJC* (64).

Notostira elongata (Geoff.) p.246

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Stifford, 11.viii.79, *LJ* (77).

KENT. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

SURREY. Mitcham Common, 20.x.51, *LC* (64); 9.ix. and 11.v.80, *LJ* (77); 7.ix.83, 26. & 27.ix.83 and 24.x.83, from grass, *JAH* (91).

Megaloceroea recticornis (Geoff.) p.248

KENT. Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14).

SURREY. Boxhill, 23.vii.80, *LJ* (77).

Trigonotylus ruficornis (Geoff.) p.249

ESSEX. Stifford, 11.viii.79, *LJ* (77).

KENT. Darenth Wood (TQ/57R), 5.viii.76, *KCS* (14).

Teratocoris antennatus (Boh.) p.250

SURREY. Reigate, n.d., in marshy places, *ES* (36).

Leptopterna dolobrata (Linn.) p.251

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 19.vi.76 and 2.vii.77, *DAS* (89).

KENT. Dartford Heath (TQ/57B), 29.vi.75, *KCS* (14); Darenth Wood (TQ/57R), 23.vii.77, *KCS* (14).

SURREY. Mitcham Common, 8.vii.79, *LJ* (77); Hackbridge, 14.vii.79, *LJ* (77); Coulsdon, 19.vii.63, *HGD* (65); Boxhill, 23.vii.80, *LJ* (77); Bookham Common, 8.vii.51, (both ordinary and orange forms) *DGH* (BDK).

Pachycoleus waltli Fieb. p.256

SURREY. Beyond the boundary at Godalming, 4.v.58, *DL* (SL).

Saldula saltatoria (Linn.) p.257

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Dagnam Park, 7.v.76, *DAS* (89).

SURREY. Bookham Common, 2.x.30, 25.iv.39 and 29.vii.50, *FJC* (SL); Esher Common, 28.vii.57, *DL* (SL); beyond the boundary at Woking, 3.vii.39, *FJC* (SL).

Saldula pilosella (Thomson) p.257

ESSEX. Beyond the boundary at Benfleet, 17.iv.49, *RDW* (SL).

KENT. Just beyond the boundary at Gravesend, 24.ix.05, on mud, *WW* (SL).

Saldula pallipes (Fab.) p.257

MIDDX. Hounslow Heath, 9.vii.53, *DL* (SL).

Chartoscirta cincta (H.-S.) p.258

HERTS. Totteridge (Darland's Lake N.R.), 9.viii.84, *PK* (85).

ESSEX. Epping Forest, ii.51, *DL* (SL); Dagnam Park, 29.vii.77 and 27.ix.77, *DAS* (89).

SURREY. Bookham Common, 9.vi.34 and 2.v.39, *FJC* (SL); 20.viii.50, *DL* (SL).

Chartoscirta elegantula (Fall.) p.259

SURREY. Beyond the boundary at Chobham Common, 3.ix.51, in Gracious Pond, n.c. (SL).

Chartoscirta cocksi (Curtis) p.259

SURREY. Beyond the boundary at Woking, 1.iv.1893, *AJC* (HD).

Hebrus ruficeps (Thomas) p.260

ESSEX. Epping Forest (Lodge Road bog (north) TL 431000), 13.iii.85, two specimens taken in small *Sphagnum* bog, *JHB* (81).

SURREY. Oxshott Heath, 10.v.53, 2.ix.50 and 16.ix.50, *DL* (SL); Esher Common (Black Pond), 29.vi.55, 1.ix.52 and 11.ix.50, *FJC* (SL); West End Common, 11.vi.51, *FJC* (SL).

Hydrometra stagnorum (Linn.) p.260

MIDDX. Edge of Ken Wood, 12.vi.49, at roots of dead horsetail *Equisetum* sp., *DL* (SL); Enfield (Beech Hill Park Lake), 25.ix.53, *IL* (86).

HERTS. Totteridge (Darland's Lake N.R.), 24.iv.82 (from edge of lake), 22.v.83 (from the new pond), 2.vi.84 (from West Pond), all amongst the *Typha*, *JHB* (85).

ESSEX. Epping Forest (Wake Valley pond), 16.iv.52, *IL* (86); (High Beech) 25.ix.82, *DAS* (89).

SURREY. Bookham Common, 8.vi.31, *FJC* (SL); on the boundary at Byfleet, 27.xi.38, *FDB* (SL); and beyond at Woking, 23.v.31, *FJC* (SL); and Brookwood, 4.v.38, *FJC* (SL).

Velia caprai Tam. p.261

MIDDX. South Mimms (Mimms Wash Stream), 10.x.54, *IL* (86); 23.iii.57, *DL* (SL).

HERTS. Watford, 21.iv.57, *IL* (86); Totteridge (Darland's Lake N.R.), 30.iv.83 (2 ♂♂, an apterous ♀, and 3 larvae from Folly Brook below the lake) and 2.vi.84 (a singleton from the second outlet to the lake), *JHB* (85).

SURREY. Wimbledon Common, 5.x.40, *FJC* (SL); (Stag Ditch), 10.x.40, *FJC* (SL);

Boxhill, 12.ix.53, *DL* (SL); Esher Common (Black Pond), 9.x.52, *FJC* (SL); Oxshott Heath, iv.39, *FJC* (SL).

Velia saulii Tam. p.262

Surrey. Wimbledon Common, 5.x.40, *FJC* (SL).

Microvelia reticulata (Burm.) p.263

Middx. Hampstead Heath, 27.v.50, *DL* (SL); (Highgate Pond No. 1), 27.v.50, apterous and winged forms, *DL* (SL); (New Pond), 1.v.50, *DL* (SL).

Kent. Lee, 16.iv.1898, at the pond, *WW* (SL).

Surrey. Esher Common (Black Pond), 2.ix.50, *FJC* (SL).

Microvelia pygmaea (Duf.) p.263

Surrey. Beyond the boundary at Woking, viii.1875, *ES* (HD).

Gerris argentatus Schumm. p.264

Essex. Epping Forest, 5.x.52, *RDW* (SL).

Gerris thoracicus Schumm. p.264

Middx. Enfield (Beech Hill Park lake), 26.iii.53, *IL* (86); Hampstead Heath, 17.viii.49, *DL* (SL); West Drayton, 27.iv.1881, *FPP* (HD).

Herts. Barnet (Hadley Green), 17.vii.49, *IL* (86).

Essex. Dagnam Park, 9. & 12.iv.80 and 9.iv.81, *DAS* (89).

Kent. Abbey Wood & Plumstead Heath, 8.v.1897, *WW* (SL); Hither Green Lane, Lee, 16.v.1896, at the pond in the field, *WW* (SL).

Surrey. Bookham Common, 8.iv.56, in bomb-crater near I.O.W. pond, *IL* (86); Esher Common, n.d., *FPP* (HD); and beyond the boundary on Horsell Common, 23.v.31, *FJC* (SL).

Gerris gibbifer Schumm. p.265

Middx. Enfield (Chase Stream), v.49, *IL* (86).

Herts. Totteridge (Darland's Lake N.R.), 30.iv.83, on the pond amongst *Typha*, *JHB* (85).

Kent. Joyden's Wood (TQ/47V), 18.xi.75, *KCS* (14).

Surrey. Purley, 3.iv.56, *JCD* in *IL* coll. (86); Coulsdon, 1952, in pond in garden (of W. Smith) in The Chase, *HGD* (65); Shirley Common, 1.v.1897 and 7.v.1898, pond in the wood, *WW* (SL); Ashtead, 11.vii.47, *FJC* (SL); Oxshott Heath, 30.iv.38, *FDB* (SL); Esher Common (Black Pond), 6.v.52 and 25.viii.52, *FJC* (SL); and beyond the boundary on Horsell Common, v.33, *FJC* (SL).

Gerris lacustris (Linn.) p.266

Middx. Hampstead Heath, 23.iv.50, *DL* (SL); (Spaniards Pond), 21.viii.49 ♀, *DL* (SL); (Highgate No. 1 pond), 27.v.50, *DL* (SL); Enfield (Beech Hill Park lake), 26.iv.53 and 25.viii.53, *IL* (86); (Chase Stream), v.49, *IL* (86); South Mimms (Wrotham Park), 4.iv.54, in large lake near boat-house, *IL* (86); (Dyrham Park), 10.ix.53, *IL* (86); Barnet, 7.v.74, *IL* (86); (Hadley Green), 24.iv.49, *IL* (86); 5.ix.51, closed habitat, pH 7.3, *IL* (86); near Hatfield, 4.v.52, in Park Gate gravel pits, *IL* (86); Broad Colney, 29.vii.51, *IL* (86); Totteridge (Darland's Lake N.R.), 30.iv.83 (two specimens in new pond) and 2.vi.84 (among *Typha* below the main outflow), *JHB* (85).

Kent. Dartford Marshes, 26.vii.53, ex. dyke, *IL* (86).

Surrey. Shirley Common, 7.v.1898, pond in the wood, *WW* (SL); Bookham Common, 22.iv.50, *DL* (SL); and beyond the boundary at Woking, 23.v.31, *FJC* (SL); and Horsell Common, 23.v.31, *FJC* (SL); 16.ix.31, *FJC* (SL).

Gerris odontogaster (Zett.) p.268

Middx. Hampstead Heath (Spaniard's Pond), 21.viii.49 ♂, *DL* (SL); Enfield (Beech Hill Park lake) 26.iii.53 and 26.iv.53, *IL* (86); (Bentley Heath, just N. of Wrotham Park), 10.iv.54, *IL* (86); South Mimms, 3.iv.53, pond near the Mimms Wash Stream, *IL* (86); Barnet, 7.v.74, *IL* (86); (Hadley Green), 8.v.53, *IL* (86).

Essex. Beyond the boundary at Benfleet, 5.xi.39, *KMG* (SL).

Kent. Dartford Marshes, 5.x.52, ex. dyke, *IL* (86).

SURREY. Leatherhead, 18.iv.48, *DL* (SL); Bookham Common, 2.iv.38, *FDB* in *FJC* coll. (SL); 29.vii.50 ♂ & ♀ *DL* (SL); 15.viii.53, *DL* (SL); 8.iv.56, in bomb crater near I.O.W. pond, *IL* (86); Ockham Common, 8.v.01, *SK* (SL); just over the boundary on Wisley Lake, 8.v.01, *SK* (SL); and beyond on Horsell Common, 23.v.31, *FJC* (SL).

Aquarius najas (De Geer) p.269

KENT. Catford, 4.ix.1897 and 13.vi.01 ♂, on River Ravensbourne, *WW* (SL); Shoreham, 11.ix.49, *DL* (SL).

SURREY. Just over the boundary at Byfleet, n.d., n.c., (SL); and beyond at Chobham, iv.1892, *ES* (HD).

BUCKS. Beyond the boundary at Amersham, 21.-28.vi.02, *FJC* (SL).

Aquarius paludum (Fab.) p.269

SURREY. Beyond the boundary at Woking, viii.1888, *ES* (HD).

Nepa cinerea Linn. p.271

MIDDX. Stanmore, 26.viii.51, IV & V instar larvae, *IL* (86); Enfield (Chase Stream), v.49, *IL* (86); South Mimms (Mimms Wash Stream southern section), 10.x.54, *IL* (86).

HERTS. Barnet, 6.xii.53, in Pond A, *IL* (86); 8.v.54, in ponds A-H, *IL* (86); (Hadley Green), 24.iv.49 (V instar) and 17.vii.49 (V instar), *IL* (86); Totteridge (Darland's Lake N.R.), 30.v.82, from lake overflow, *JHB* (85).

KENT. Dartford Marshes, 26.vii.53, V instar larva ex. dyke, *IL* (86).

Ranatra linearis (Linn.) p.272

MIDDX. Stanmore, 5.vi.83, in pond, *JHB* (85).

HERTS. Barnet, 24.iv.49 and v.75, *IL* (86).

ESSEX. Epping Forest (Earls Path pond), vi.51, *IL* (86).

Ilyocoris cimicoides (Linn.) p.273

MIDDX. Enfield (Bentley Heath), 10.iv.54, from pond, *IL* (86); South Mimms, 3.iv.53, in pond near Mimms Wash, *IL* (86); (Mimms Wash Stream), 20.ix.53, *IL* (86).

HERTS. Barnet (Hadley Green), 5.ix.51, in pond in open habitat pH 4.5 *IL* (86).

KENT. Dartford Marshes, 5.x.52, ex dyke, *IL* (86).

SURREY. Mitcham Common, 19.ix.83, in both ponds, *JAH* (91).

Notonecta glauca Linn. p.275

MIDDX. Hampstead Heath, 19.iv.82, in Viaduct Pond, *JHB* (85); Stanmore, 26.viii.51, *IL* (86); South Mimms (Wrotham Park), 4.iv.54, in large lake near boat house, *IL* (86); (Dyrham Park), 22.iii.53, at locality No. 1, *IL* (86); (Mimms Wash Stream southern section), 10.x.54, *IL* (86).

HERTS. Barnet, 7.v.74, *IL* (86); (Hadley Green), Pond A, (22.ii.53, 18.xi.53 and 4.iv.54) and Pond C (6.v.53), *IL* (86); 16.vii.49, *IL* (86); Symonshyde, S.E. of Wheathampstead, 27.iii.59 and 26.iv.59 in Pond D, *IL* (86); Totteridge (Darland's Lake), 2.vi.84, from lake outflow below covergence, *JHB* (85).

ESSEX. Epping Forest (Fairmead Bottom), 29.ix.52, in bomb crater ponds 1 & 3, *IL* (86); Dagnam Park, 16.iv.80, *DAS* (89).

KENT. Dartford Marshes, 5.x.52, ex. dykes, *IL* (86).

SURREY. Mitcham Common, 15.ix.83, in both ponds, *JAH* (91).

Notonecta obliqua Thunb. p.277

HERTS. Barnet (Hadley Green), 16.vii.49 and 7.v.54; 5.ix.51 open habitat pond with pH 4.5; 11.i.53, 27.i.53 and 22.ii.53 (Pond B); 9.iii.53 (Ponds A & D), 16.v.53 (Pond C) and 22.xi.53 (Pond C) – all records of *IL* (86).

ESSEX. Epping Forest (Fairmead Bottom), 23.iii.52 & 16.iv.52 (bomb crater pond, clay ride) and 29.ix.52 (in bomb craters 1 & 3), *IL* (86).

SURREY. Wimbledon Common, 29.x.52, in Scio Pond, *DJC & JABo* in *IL* coll. (86).

Further records of the var. *delcourti* are:

HERTS. Barnet (Hadley Green), 16.vii.49 and 9.iii.53 (Pond A), *IL* (86).

ESSEX. Epping Forest (Fairmead Bottom), 29.ix.52 (bomb crater Pond 1) and 23.ix.52 (bomb crater Pond 2, pH 7.0), *IL* (86).

Notonecta viridis Delc. p.278

Middx. (Dyrham Park), 22.iii.53, *IL* (86); (Wrotham Park), 4.iv.54 (in large lake) and 22.iv.53 (with dredge net), *IL* (86); (Mimms Wash Stream), 11.x.53 and 29.xi.53, *IL* (86).

Herts. Barnet (Hadley Green), 28.i.53 (Pond D), 22.ii.53 (Ponds A & D), 22.xi.53 (Pond C) and 13.xii.53 (Pond B), *IL* (86); Barnet, 8.v.54 and 29.xi.54, *IL* (86); Sandridge, gravel pit, 22.ii.59, *IL* (86); Symondshyde, S.E. of Wheathampstead, 26.iv.59, in Pond D, *IL* (86); Radlett, 25.ii.59, pond near gravel pit, and 6.iii.59, in gravel pit, *IL* (86).

Essex. Dagnam Park, 4.iv.80, *DAS* (89).

Surrey. Wimbledon Common, 16.xii.51, *DJC & JABo* in *IL*. coll. (86).

Notonecta maculata Fab. p.279

Middx. Northolt, ix.53, in static water tank, *IL* (86); Enfield (Chase Stream), v.49, *IL* (86).

Herts. Barnet (Hadley Green), 25.viii.53, in Pond C. *IL* (86); Sandridge Gravel Pit, 22.ii.59, *IL* (86).

Essex. Epping Forest (Fairmead Bottom), 23.iii.52, in bomb-crater Pond 3, pH 7.0, *IL* (86).

Surrey. Wimbledon Common, 29.xi.53, *DJC* in *IL* coll. (86); 9.xii.51, *DJC & JABo* in *IL* coll. (86); Bookham Common, 9.v.54, in Bayfield bomb crater, *IL* (86).

Plea atomaria (Pallas) p.280

Surrey. Just over the boundary at Woking, 23.v.31, *FJC* (SL).

Micronecta scholtzi (Fieb.) p.281

Middx. Enfield (Beech Hill Park lake), 25.viii.53 and 25.ix.53, *IL* (86); South Mimms (Wrotham Park), 29.viii.54, *IL* (86).

Cymatia coleoptrata (Fab.) p.283

Herts. Barnet, 7.v.74, *IL* (86).

Essex. Epping Forest (Earls Path pond), 15.iii.53, *IL* (86).

Cymatia bondsdorffi (Sahlb.) p.283

Middx. Hampstead Heath, 22.iv.50, in Viaduct Pond, *DL* in *IL* coll. (86).

Herts. Radlett, 25.ii.59, in gravel pit, *IL* (86).

Callicorixa praeusta (Fieb.) p.284

Middx. Enfield (Beech Hill Park lake), 28.i.53, *IL* (86); South Mimms (Dyrham Park), 22.iii.53 and 11.x.53, *IL* (86); (Wrotham Park), 8.iii.53 and 10.x.54, in Heron lake, *IL* (86); (Mimms Wash Stream), 13.iv.54 and 5.iv.54, *IL* (86); small pond near Mimms Wash Stream, 29.iii.53, *IL* (86).

Herts. Barnet (Hadley Green), 25.ix.53, 25.x.53 (Pond A) and 9.xi.53 (Pond A), *IL* (86); Radlett Gravel Pit, 6.iii.59, *IL* (86); Wheathampstead, vii.58, at light, *IL* (86); St. Albans, 27.ix.53, in River Ver, *IL* (86).

Essex. Walthamstow Marshes, 25.ix.83, in bomb-hole pond, *JHB* (85); Epping Forest (Fairmead Bottom), 15.iii.53, in pond, *IL* (86).

Surrey. Wimbledon Common, 12.x.52, *DJC & JABo* in *IL* coll. (86); 29.xi.53 and 5.xii.53, in gravel pit, *DJC* in *IL* coll. (86).

Corixa punctata (Illig.) p.286

Middx. Stanmore, 26.vii.51, *IL* (86); Enfield (Chase Stream), v.49, *IL* (86); South Mimms, 3.iv.53, pond near Mimms Wash Stream, *IL* (86); (Dyrham Park), 18.i.53 and 17.v.53, *IL* (86); (Wrotham Park), 22.ii.53, 4.iv.53 (in large lake) and 2.iv.54 (in Heron Lake), *IL* (86); (Mimms Wash Stream), 8.v.53 and 29.iii.53, *IL* (86).

Herts. Barnet (Hadley Green), 24.iv.49, 16. & 17.vii.49 and 8.v.50; 5.ix.51 pond with closed habitat pH 7.3; 27.i.53 (Pond G), 28.i.53 (Pond D), 23.ii.53 (Pond D), 9.iii.53 (Pond D), 26.iii.53 (Pond B), 6.v.53 (Pond A) and 25.viii.53 (Pond A) – all records of *IL* (86); Elstree (Aldenham Reservoir), 29.i.53, *IL* (86); Radlett, 25.xi.59, in pond near gravel pit, *IL* (86); near Hatfield (Park Gate gravel pits), 4.v.52, *IL* (86); Wheathampstead, 25.viii.59, at light, *IL* (86); Broad Colney, 21.i.51, *IL* (86).

Essex. Epping Forest (Fairmead Bottom), 15.iii.53, in pond, *IL* (86); (Robin Hood pond), 24.x.54, *PNL* in *IL* coll. (86); (New Pond), 28.ix.52, *IL* (86); Dagnam Park, 27.ix.77, *DAS* (89).

Kent. Dartford Marshes. 5.x.52, ex. dyke, *IL* (86); Chislehurst (Chislehurst Common Upper pond), 17.x.54, *IL* (86).

Surrey. Richmond Park (White Ash Pond), 6.i.52, *DJC & JABo* in *IL* coll. (86); Wimbledon Common, 12.x.51 and 16.xii.51, *DJC & JABo* in *IL* coll. (86); Mitcham Common, 15.ix.83, in both ponds, *JAH* (91); Bookham Common (Lower Eastern Pond), 11.iv.54, *IL* (86).

Hesperocorixa sahlbergi (Fieb.) p.290

Herts. Totteridge (Darland's Lake N.R.), 30.iv.83 ♀, *JHB* (85).

Sigara dorsalis (Leach) p.296

Herts. Totteridge (Darland's Lake N.R.), 2.vi.84, a single ♀ in lake overflow below convergence and a ♀ and 3 ♂♂ from near main weir, *JHB* (85).

Surrey. Limpsfield, 1940-1960, Grid Ref. 51/45, *CHA* (17).

Sigara distincta Fieb. p.303

Herts. Totteridge (Darland's Lake N.R.), 2.vi.84 ♀, from lake overflow below convergence, *JHB* (85).

Surrey. Bookham Common, 8.v.55, *DGH* (BDK).

Sigara lateralis (Leach) p.304

Herts. Totteridge (Darland's Lake N.R.), 30.iv.83 (9 ♂♂), 8.vii,83 (♀ from the new pond), 6.xi.83 (3 ♂♂, 4 ♀♀), and 2.vi.84 (♀ from West Pond and 2 ♂♂ & 3 ♀♀ from lake below convergence), *JHB* (85).

Sigara nigrolineata (Fieb.) p.305

Herts. Totteridge (Darland's Lake N.R.), 30.iv.83, (six specimens) and 8.vii.83 (♂ in the new pond), *JHB* (85).

Sigara semistriata (Fieb.) p.309

Surrey. Esher Common, 23.x.51 ♂ & ♀, *FJC* (SL); and beyond the boundary on Horsell Common, 16.ix.31 ♀, *FJC* (SL).

Index to Heteroptera species mentioned in this Addendum

The numbers following the species names refer to the sequential pagination given at the foot of each page in this part only.

Acalypta parvula 356
———— platycheila 356
Acanthosoma haemorrhoidale 345
Acompocoris pygmaeus 360
Acompus rufipes 353
Adelphocoris lineolatus 369
Aelia acuminata 347
Aeschyntelus maculatus 351
Alloeotomus gothicus 362
Alydus calcaratus 350
Amblytylus nasutus 362
Anaptus major 359
Aneuris avenius 345
———— laevis 345
Anthocoris butleri 360
———— confusus 359
———— *minki* 359
———— nemoralis 359
———— nemorum 360
———— sarothamni 360
———— simulans 359
Aptus mirmicoides 358
Aquarius najas 373
———— paludum 373
Aradus cinnamomeus 344
———— corticalis 344
———— depressus 344
Asciodema obsoletum 364
Atractotomus magnicornis 364
———— mali 364
Bathysolen nubilus 350
Berytinus clavipes 356
———— crassipes 355
———— minor 356
———— montivagus 356
———— signoreti 356
Blepharidopterus angulatus 366
Callicorixa praeusta 374
Calocoris norvegicus 369
———— quadripunctatus 368
———— *sexguttatus* 369
———— stysi 369
Campylomma verbasci 364
Campyloneura virgula 365
Campylosteira verna 356
Capsodes gothicus 370
Capsus ater 370
Catoplatus fabricii 357

Charogochilus gyllenhalli 368
Chartoscirta cincta 371
———— cocksi 371
———— elegantula 371
Chlamydatus pullus 364
Cimex lectularis ssp. lectularis 361
Compsidolen salicellus 364
Coniortodes salicellus 364
Coranus subapterus 357
Coreus marginatus 350
Coriomeris denticulatus 350
Corixa punctata 324
Cyllecoris *flavonotatus* 373
———— histrionicus 366
Cymatia bonsdorffi 374
———— coleoptrata 374
Cymus claviculus 355
———— glandicolor 355
———— melanocephalus 355
Cyphostethus tristriatus 345
Deraeocoris lutescens 361
———— olivaceus 362
———— ruber 361
———— scutellaris 361
Derephysia foliacea 357
Dicranocephalus medius 351
Dictyonota fuliginosa 356
———— strichnocera 356
———— *tricornis* 357
Dicyphus annulatus 365
———— constrictus 365
———— epilobii 365
———— errans 365
———— globulifer 365
———— pallicornis 365
———— stachydis 365
Dolichonabis limbatus 359
Dolycoris baccarum 348
Drymus brunneus 354
———— pilicornis 354
———— pilipes 354
———— ryei 354
———— sylvaticus 354
Dryophilicornis flavoquadrimaculatus 366
Elasmostethus interstinctus 345
———— tristriatus 345
Elasmucha grisea 345
Empicornis culiciformis 357
———— vagabundus 357
Eremocoris podagricus 355
Eurydema dominulus 349
———— oleracea 349
Eurygaster maura 347
———— testudinaria 347
Eysarcoris fabricii 348
Gampsocoris punctipes 356
Gastrodes grossipes 355
Gerris argentatus 372
———— gibbifer 372
———— lacustris 372
———— odontogaster 372
———— thoracicus 372
Gonocerus acuteangulatus 350
Hallodapus rufescens 364
Harpocera thoracica 362
Hebrus ruficeps 371
Hesperocorixa sahlbergi 375
Heterocordylus tibialis 366
Heterogaster artemisiae 352
———— urticae 351
Heterotoma planicornis 366
Himacerus apterus 358
———— *mirmicoides* 358
Hydrometra stagnorum 371
Ilyocoris cimicoides 373
Ischnocoris angustulatus 354
Ischnodemus sabuleti 352
Kalama tricornis 357
Kleidocerys resedae 352
———— truncatulus ssp. ericae 352
Legnotus limbatus 346
———— picipes 346
Leptopterna dolobrata 371
Liocoris tripustulatus 367
Lopus decolor 362
Loricula elegantula 361
Lyctocoris campestris 361
Lygocoris contaminatus 368
———— lucorum 368
———— pabulinus 368
———— spinolai 368
———— viridis 368
Lygus maritimus 367
———— rugulipennis 367
Macrodema micropterum 353
Macrolophus rubi 365
Malacoris chlorizans 366
Mecomma ambulans 367
Megacoelum beckeri 369
———— infusum 369
Megaloceroea recticornis 370
Megalocoleus molliculus 362
———— pilosus 362
Megalonotus antennatus 353
———— chiragra 353
———— dilatatus 353
Metatropis rufescens 356
Micronecta scholtzi 374
Microvelia pygmaea 372
———— reticulata 372
Miris striatus 368
Monalocoris filicis 361
Myrmedobia distinguenda 361
Myrmus miriformis 351
Nabicula flavomarginata 357
———— limbatus 359
Nabis ericetorum 358
———— ferus 358
———— *flavomarginatus* 357
———— rugosus 358
Neodicyphus rhododendri 365
Neomecomma bilineatus 367
Neottiglossa pusilla 347
Nepa cinerea 373
Notonecta glauca 373
———— maculata 374
———— obliqua 373
———— viridis 374
Notostira elongata 370
Nysius ericae 352

—— helveticus 352
—— thymi 352
Oncotylus viridiflavus 362
Orius majusculus 360
—— *minutus* 360
—— niger ssp. compressicornis 361
—— vicinus 360
Orthocephalus coriaceus 366
Orthonotus rufifrons 362
Orthops campestris 368
—— cervinus 368
Orthotylus adenocarpi 367
—— bilineatus 367
—— flavinervis 366
—— marginalis 366
—— nassutus 366
—— ochrotrichus 367
—— prasinus 367
—— tenellus 366
—— virescens 367
Pachycoleus waltli 371
Pachylops bicolor 366
Palomena prasina 348
Pantilius tunicatus 370
Pentatoma rufipes 349
Peritrechus geniculatus 352
—— lundi 352
—— *nubilus* 352
Phoenicocoris obscurellus 363
Phylus coryli 362
—— melanocephalus 362
—— palliceps 362
Phytocoris dimidiatus 369
—— longipennis 369
—— reuteri 369
—— tiliae 369
—— ulmi 369
—— varipes 370
Picromerus bidens 349
Piesma maculatum 356
Piezodorus lituratus 348
Pilophorus clavatus 365
Pithanus maerkeli 367
Polymerus nigritus 368
Plagiognathus albipennis 364
—— arbustorum 364
—— chrysanthemi 364
Plinthisus brevipennis 354
Plea atomaria 374
Podops inuncta 347
Psallus albicinctus 363
—— *alnicola* 363
—— ambiguus 363
—— betuleti 362
—— diminutus 363
—— falleni 363
—— haematodes 363
—— lepidus 363
—— perrisi 363
—— quercus 363
—— *roseus* 363
—— scholtzii 363
—— variabilis 363
—— varians 363
—— wagneri 363
Pseudoloxops coccineus 367
Raglius alboacuminatus 353
Ranatra linearis 373
Reduvius personatus 357
Rhacognathus punctatus 350
Rhopalus maculatus 351
—— parumpunctatus 351
—— rufus 351
—— subrufus 351
Saldula pallipes 371
—— pilosella 371
—— saltatoria 371
Salicarus roseri 364
Sciocoris cursitans 347
Scolopostethus affinis 354
—— decoratus 355
—— grandis 354
—— thomsoni 355
Sehirus bicolor 346
—— biguttatus 347
—— dubius 346
—— luctuosus 347
Sigara distincta 375
—— dorsalis 375
—— lateralis 375
—— nigrolineata 375
—— semistriata 375
Spathocera dahlmanni 350
Stalia boops 359
—— *major* 359
Stenodema calcaratum 370
—— laevigatum 370
Stenotus binotatus 369
Stephanitis rhododendri 357
Sthenarus rotermundi 364
Stygnocoris fuligineus 353
—— rusticus 353
—— sabulosus 353
Syromastes rhombeus 350
Systellonotus triguttatus 365
Taphropeltus contractus 355
Tetraphleps bicuspis 360
Teratocoris antennatus 370
Thyreocoris scarabaeoides 347
Tingis ampliata 357
—— cardui 357
—— reticulata 357
Trapezonotus dispar 353
Trigonotylus ruficornis 370
Troilus luridus 349
Tropistethus holosericeus 353
Velia caprai 371
—— saulii 372
Xylocoris cursitans 361
Zicrona caerulea 350

Index to plants mentioned in this Addendum

(Family arrangement as in Clapham, Tutin and Warburg (1981); genera and species in alphabetical order)

PTERIDOPHYTA

EQUISETACEAE
Equisetum sp. horsetail 371
HYPOLEPIDACEAE
Pteridium aquilinum bracken 348, 352, 355

SPERMATOPHYTA
GYMNOSPERMAE

PINACEAE
Picea sp. spruce 355
Pinus sylvestris Scots pine 350, 355, 358, 367
CUPRESSACEAE
Juniperus communis juniper 345
TAXACEAE
Taxus baccata yew 350

ANGIOSPERMAE

CRUCIFERAE
Alliaria petiolata hedge garlic 346, 349
CARYOPHYLLACEAE
Silene dioica (Lychnis dioica) red campion 346
ACERACEAE
Acer pseudoplatanus sycamore 348, 361, 366
BUXACEAE
Buxus semperivirens box 350
LEGUMINOSAE
Cytisus scoparius (Sarothamnus scoparius) broom 353, 356, 367
Lupinus polyphyllus lupin (garden escape) 348, 351
Medicago lupulina black medick 350
Ononis sp. rest-harrow 356
Ulex europaeus gorse or furze 348, 349, 356, 357, 364
ROSACEAE
Crataegus sp. hawthorn 345, 363
Potentilla palustris marsh cinquefoil 351
Rubus fruticosus agg. bramble or blackberry 345, 346, 369
ONAGRACEAE
Epilobium sp. willowherb 364
SANTALACEAE
Thesium humifusum bastard toadflax 346
ARALIACEAE
Hedera helix ivy 348
UMBELLIFERAE
Heracleum sphondylium hogweed 346
POLYGONACEAE
Rumex sp. dock 346, 352
URTICACEAE
Urtica dioica stinging nettle 347, 351, 354, 355, 357
ULMACEAE
Ulmus sp. elm 367
BETULACEAE
Betula pubescens hairy birch 346
Betula sp. birch 345, 346, 348, 349, 358, 360, 361, 368
CORYLACEAE
Corylus avellanae hazel 349

FAGACEAE	
Fagus sylvatica beech	349
Quercus robur common or pedunculate oak	346, 363
——— *cerris* Turkey oak	369
——— sp. oak (unspecified)	345, 346, 348, 349, 358, 361, 367, 369
SALICACEAE	
Populus alba white poplar	367
——— *italica* Lombardy poplar	359
——— sp. poplar (unspecified)	360, 361, 367
Salix sp. sallow	349, 360, 367
ERICACEAE	
Calluna vulgaris heather or ling	349, 351, 355
Erica sp. heath	351, 352, 353, 354, 355
Rhododendron ponticum rhododendron	365
OLEACEAE	
Fraxinus excelsior ash	345, 363
Ligustrum vulgare wild privet	348
SCROPHULARIACEAE	
Verbascum thapsus great mullein	357
LABIATAE	
Ballota nigra black horehound	346
Lamium album white deadnettle	346
Lamium sp. deadnettle (unspecified)	346
Stachys sylvatica hedge woundwort	349, 368
Stachys sp.	346, 348
CAPRIFOLIACEAE	
Sambucus nigra elder	345
COMPOSITAE	
Aster sp. garden aster	364
Cirsium sp. thistle	356, 364
TYPHACEAE	
Typha sp. reedmace	371, 372
GRAMINEAE	
Bromus sp. brome grass	364

Summary and Discussion

The London Natural History Society's officially adopted area of study is that which lies within a circle having a radius of 20 miles (32km) from St Paul's Cathedral in the City of London. This embraces about 1,300 square miles and covers the whole of the former county of Middlesex and parts of southern Hertfordshire, S.W. Essex, N.W. Kent and N.E. Surrey, together with a small portion of eastern Buckinghamshire. As described in Pt I (*L.N.* **43,** p.35) this present series of papers has for historic reasons recognised the Watsonian vice-county boundaries and not those of the administrative boundaries which were created, first for the London County Council, then later enlarged on the formation of the Greater London Council.

The centre of the London area is densely built up and continues outwards for an average of about 10 miles, though it is interspersed randomly with such open spaces as parks, railway embankments and sidings, river margins and waste places. This inner zone, however, accounts for no more than about a quarter of the whole of the L.N.H.S. area. The remainder, though urbanised further outwards from the centre than is the case with any other conurbation in Britain, it has nevertheless, retained a considerable amount of rural scenery with a patchwork of woodlands, fields and hedgerows. Up to about 150 years ago this surrounding country landscape commenced beyond Highgate and Hampstead to the north of London, Fulham to the west, and Dulwich in the south. Today the urban fringe extends as far as Enfield, Upminster, Uxbridge and Epsom (Fitter 1945).

The primary factor governing the vegetational cover is the surface soil. On either side of the River Thames is a thin strip of alluvium, beyond which lies the London Clay, more extensive on the north side than towards the south. In parts the London clay is overtopped with the Bagshot sands, creating acidic gravelly conditions over the neutral clay. The line of the chalk of the North Downs, broad as it enters our eastern boundary south of the Thames, tapers westward to leave the L.N.H.S. area by the River Mole gap. Only small patches of the Gault and Upper Greensand are represented occurring just at the foot of the south facing (scarp) slope of the North Downs. This mixture of soil types just mentioned has given rise to a varied vegetational cover in all except the central heavily built-up City. For a more detailed account of London's geology and flora the reader is referred to the works of Sherlock (1947) and Burton (1983) respectively.

This present study of London's Heteroptera comprises 16 parts of which this is the final part. It has entailed the examination over the last twenty years of many thousands of specimens in collections in both national and provincial museums as well as those in private hands, together with the vetting of an almost equal number of records extracted from the published literature. In Pt I a short history of London's heteropterists was given and an inspection of this shows that our knowledge of the region covers the period from 1850 until the present, i.e. approximately 135 years.

Throughout the *Heteroptera of the London Area* series, including the addenda given in this present part, a total of 450 different species has been discussed in its pages. Within this total 1 species *(Cimex dissimilis)* is no longer regarded as British and 5 species are of doubtful record:

Megalocoleus sabulicola
Gerris lateralis subsp. *asper*
——— *costai*
Arctocorisa carinata
Sigara striata

11 species are of alien origin and do not appear to have established themselves:

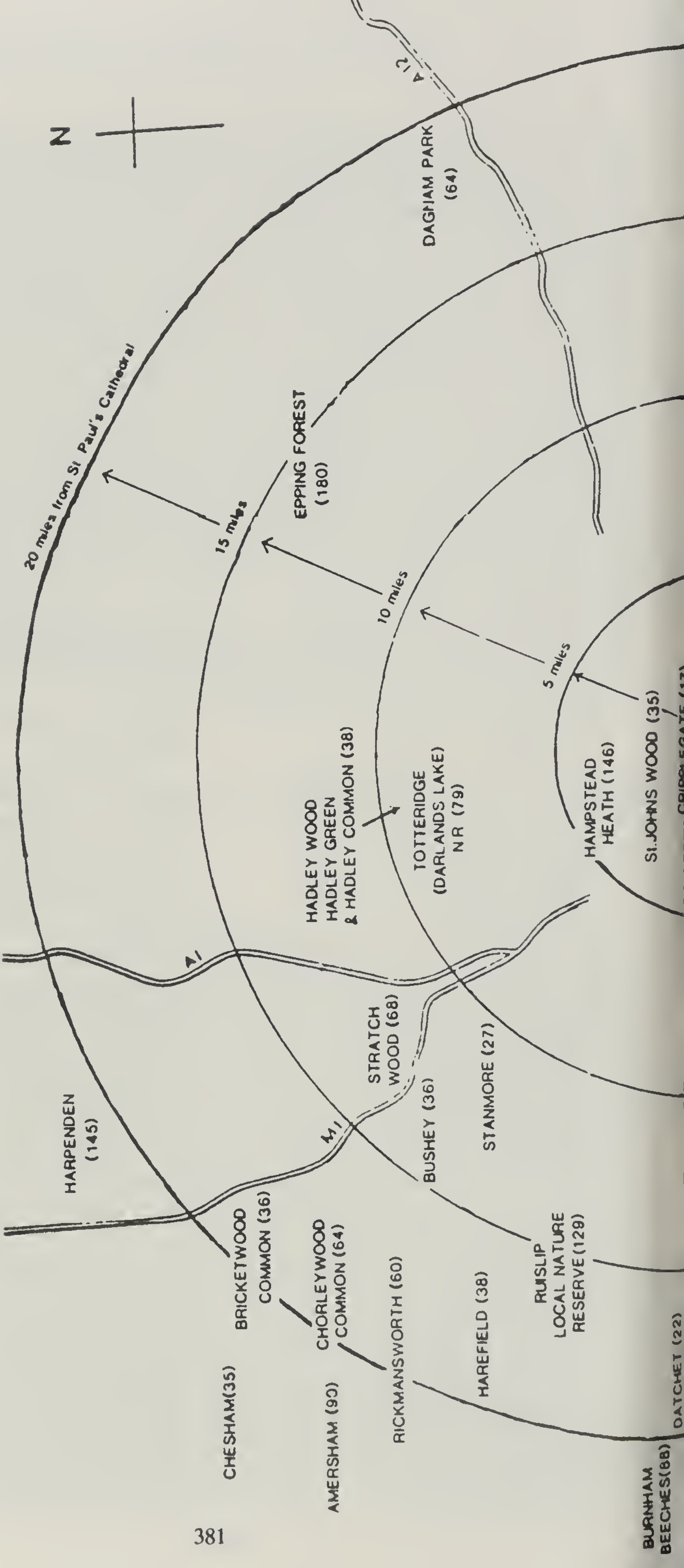
Nezara viridula
Liorrhyssus hyalinus
Metapoplax ditomoides
Prostemma guttula
Lasiochilus sladeri
Xylocoris flavipes
Tenthecoris orchidearum
———— *bicolor*
Campylomma nicolasi
Lygocoris limbatus
Limnoporus rufoscutellatus

18 species are marginal to the L.H.N.S. area, but have been included in the body of this paper as they may yet turn up with within the 20-mile limit:

Eysarcoris aeneus
Rhopalus rufus
Henestaris halophilus
Pachybrachius fracticollis
———— *luridus*
Gastrodes abietum
Nabis brevis
Anthocoris visci
Cimex lectularis subsp. *columbarius*
Amblytylus delicatus
Hallodapus montandoni
Pilophorus confusus
Globiceps woodroffei
Orthotylus rubidus
Myrmecoris gracilis
Pachycoleus waltli
Microvelia pygmaea
Sigara selecta

Of the remaining 415 species the following 24 have not been recorded in the L.N.H.S. area since pre-1900:

Aradus corticalis
——— *aterrimus*
Odontoscelis dorsalis
Holcostethus vernalis
Chlorochroa juniperina
Arenocoris falleni
Stictopleurus punctatonervosus
Rhopalus parumpunctatus
Megalonotus praetextatus
Acompus rufipes
Lasiosomus enervis
Scolopostethus pictus
Eremocoris fenestratus
Taphropeltus limbatus
Cymus obliquus
Acalypta brunnea
Onochila simplex
Empicoris baerensprungi
Nabicula lineata
Xylocoridea brevipennis
Myrmedobia exilis
Strongylocoris luridus
Globiceps dispar
Chartoscirta elegantula


N
A12
DAGNAM PARK (64)
20 miles from St Paul's Cathedral
15 miles
10 miles
5 miles
EPPING FOREST (180)
HADLEY WOOD
HADLEY GREEN
& HADLEY COMMON (38)
TOTTERIDGE (DARLANDS LAKE) NR (79)
HAMPSTEAD HEATH (146)
St.JOHNS WOOD (35)
A1
M1
HARPENDEN (145)
STRATCH WOOD (68)
STANMORE (27)
BUSHEY (36)
BRICKETWOOD COMMON (36)
CHORLEYWOOD COMMON (64)
RICKMANSWORTH (60)
HAREFIELD (38)
RUISLIP LOCAL NATURE RESERVE (129)
CHESHAM (35)
AMERSHAM (90)
BURNHAM BEECHES (88)
DATCHET (22)

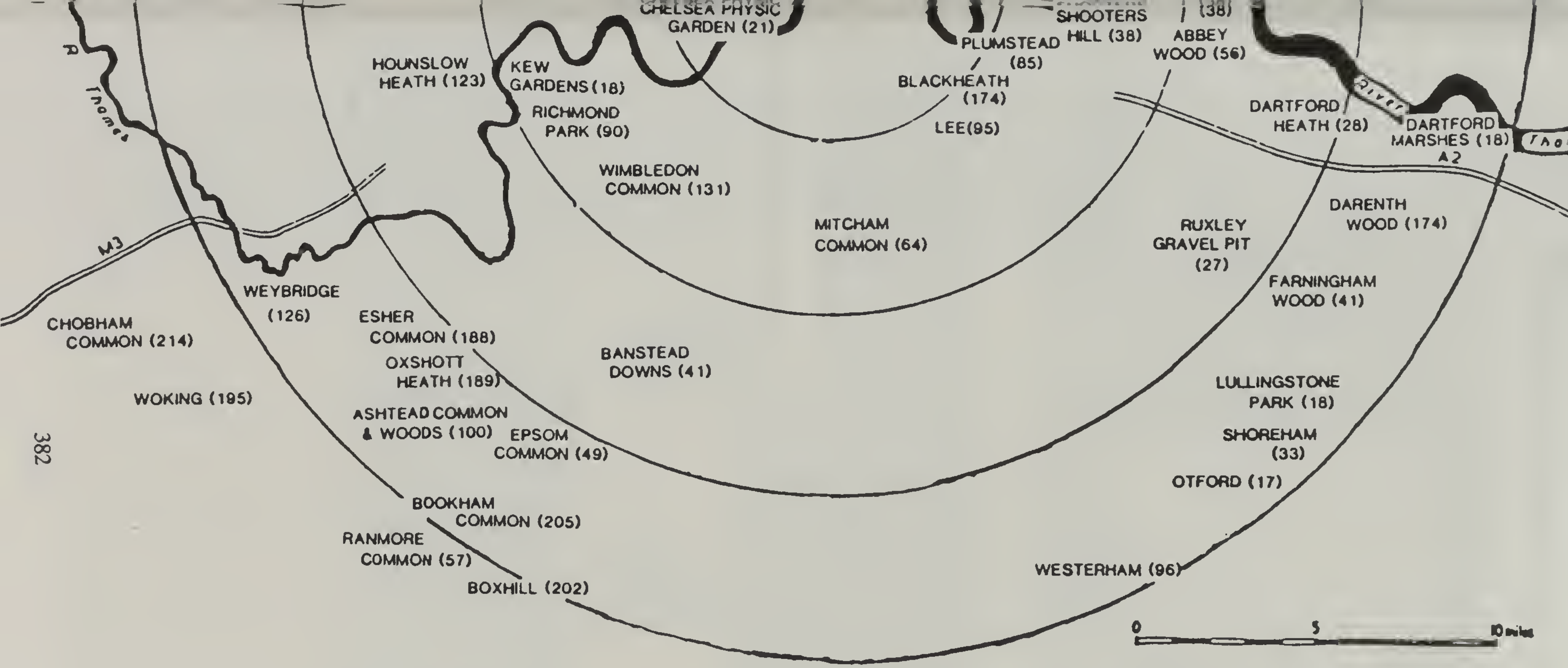


FIGURE 1. Map showing a widespread selection of localities, both within and just outside the L.N.H.S. area, at which Heteroptera have been recorded. (N.B. Figures given in brackets indicate species totals, though these could be increased at most localities with further investigation).

Then out of the 391 species left the following 28 were recorded in the years between 1900 to the end of 1949 but not since:

Dicranocephalus medius
Heterogaster artemisiae
Graptopeltus lynceus
Aphanus rolandri
Drymus pilipes
—— *latus*
Scolopostethus puberulus
Eremocoris abietis
Taphropeltus hamulatus
Acalypta carinata
Temnostethus pusillus
Acompocoris alpinus
Xylocoris formicetorum
Brachysteles parvicornis
Cardiostethus fusciiventris
Oeciacus hirundinis
Loricula pselaphiformis
Myrmedobia distinguenda
——— *coleoptrata*
Conostethus roseus
Amblytylus brevicollis
Pityopsallus luridus
Pachytomella parallela
Globiceps cruciatus
Capsodes flavomarginatus
Teratocoris saundersii
Hebrus pusillus
Micronecta minutissima

Finally, this leaves a total of 363 species which represents those that have been recorded in the London area from 1950 onwards. They are enumerated in the list which follows together with an abundance scale assessed for each.

N.B. Throughout the species treatments in the preceding fifteen parts of this paper degrees of abundance had been assessed for most species, but in preparing this summary it was realized that the assessment was not standardized. Therefore, for the purpose of the present list, each species has been re-assessed. Many have remained as originally designated but the term 'local' has been changed mostly to 'occasional' and the term 'locally common' to 'frequent'. Some species, particularly in Part I, were not originally assigned degrees of abundance and these have now been given categories for the first time.

From the list the totals under each category in the six-point scale of abundance are as follows (taking the 363 figure as being 100%):

Very rare	5 (1.4%)
Rare	98 (27.0%)
Occasional	146 (40.2%)
Frequent	50 (13.8%)
Common	52 (14.3%)
Abundant	12 (3.3%)

Although these figures are based on subjective estimates they interestingly show that for those species recorded since 1950 only a few have been classed as 'very rare'. Conversely, only marginally more species within the L.N.H.S. area in sufficient numbers to be regarded as being 'abundant'. Obviously with further work and recording the ratings applied to some species may change. It is hoped that some of those under the list of those not recorded since before 1950 may reappear and those that are at present found just outside our boundary may yet occur within it. What is quite clear is the need for careful monitoring of those species assessed as 'very rare' and 'rare' and special measures should be considered for their safety if there is a likelihood of their habitat being altered in any way.

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Aradus corticalis	+					
——— *depressus*			+			
——— *cinnamomeus*			+			
Aneurus laevis				+		
——— *avenius*		+				
Acanthosoma haemorrhoidale				+		
Elasmostethus tristriatus		+				
——— *interstinctus*				+		
——— *grisea*				+		
Legnotus limbosus			+			
——— *picipes*		+				
Sehirus bicolor				+		
——— *dubius*	+					
——— *luctuosus*				+		
Thyreocoris scarabaeoides			+			
Eurygaster maura			+			
——— *testudinaria*		+				
Podops inuncta			+			
Sciocoris cursitans			+			
Aelia acuminata			+			
Neottiglossa pusilla			+			
Eysarcoris fabricii				+		
Palomena prasina					+	
Dolycoris baccarum				+		
Piezodorus lituratus			+			
Pentatoma rufipes				+		
Eurydema oleracea			+			
——— *dominulus*		+				
Picrmerus bidens					+	
Troilus luridus			+			
Rhacognathus punctatus			+			
Zicrona caerulea			+			
Gonocerus acuteangulatus	+					
Coreus marginatus			+			
Syromastes rhombeus			+			
Spathocera dahlmanni		+				
Bathysolen nubilus		+				
Ceraleptus lividus		+				
Coriomeris denticulatus			+			
Alydus calcaratus			+			
Rhopalus maculatus		+				
——— *subrufus*			+			
Myrmus miriformis					+	
Heterogaster urticae				+		
Chilacis typhae			+			
Ischnodemus sabuleti			+			
Nysius thymi		+				
——— *ericae*		+				
——— *helveticus*		+				
Kleidocerys resedae				+		
——— *truncatulus* subsp. *erica*			+			
Peritrechus lundi			+			
——— *geniculatus*			+			
Raglius alboacuminatus		+				
Megalonotus antennatus		+				
——— *dilatatus*		+				
——— *chiragra*			+			
Rhyparochromus pini			+			
Trapezonotus desertus		+				
——— *dispar*		+				
Macrodema micropterum			+			

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Tropistethus holosericeus		+				
Stygnocoris rusticus			+			
——— *sabulosus*					+	
——— *fuligineus*				+		
Plinthisus brevipennis			+			
Ischnocoris angustulatus			+			
Drymus pilicornis		+				
——— *sylvaticus*				+		
——— *ryei*			+			
——— *brunneus*				+		
Lamproplax picea		+				
Scolopostethus affinis					+	
——— *grandis*			+			
——— *thomsoni*					+	
——— *decoratus*					+	
Eremocoris podagricus		+				
Taphropeltus contractus			+			
Gastrodes grossipes			+			
Cymus claviculus			+			
——— *melanocephalus*			+			
——— *glandicolor*				+		
Berytinus crassipes			+			
——— *montivagus*			+			
——— *signoreti*			+			
——— *minor*			+			
——— *clavipes*		+				
Neides tipularis		+				
Gampsocoris punctipes		+				
Metatropis rufescens			+			
Piesma maculatum			+			
——— *quadratum*		+				
Campylosteira verna		+				
Acalypta platychila		+				
——— *parvula*			+			
Dictyonota strichnocera			+			
——— *fuliginosa*		+				
Kalama tricornis		+				
Derephysia foliacea			+			
Stephanitis rhododendri			+			
Tingis reticulata		+				
——— *ampliata*					+	
——— *cardui*				+		
Catoplatus fabricii		+				
Physatocheila dumetorum		+				
——— *smreczynskii*		+				
Dictyla convergens			+			
Agramma laeta		+				
Empicoris vagabundus			+			
——— *culiciformis*		+				
Reduvius personatus			+			
Coranus subapterus			+			
Nabicula flavomarginatus					+	
——— *ferus*					+	
——— *rugosus*						+
——— *ericetorum*					+	
——— *limbatus*						+
Aptus mirmicoides				+		
Himacerus apterus					+	
Anaptus major			+			
——— *boops*			+			

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Temnostethus gracilis		+				
Elatophilus nigricornis		+				
Anthocoris confusus						+
———— *simulans*		+				
———— *nemoralis*						+
———— *butleri*			+			
———— *sarothamni*			+			
———— *gallarumulmi*			+			
———— *nemorum*						+
———— *limbatus*		+				
Tetraphleps bicuspis			+			
Acompocoris pygmaeus			+			
Orius majusculus			+			
—— *vicinus*			+			
—— *niger* subsp. *compressicornis*			+			
—— *laevigatus*		+				
Lyctocoris campestris			+			
Xylocoris galactinus			+			
———— *cursitans*			+			
Dufouriellus ater		+				
Cimex lectularius subsp. *lectularius*			+			
—— *pipistrelli*		+				
Loricula elegantula			+			
Monalocoris filicis					+	
Bryocoris pteridis			+			
Deraeocoris lutescens					+	
———— *ruber*					+	
———— *scutellaris*			+			
———— *olivaceus*			+			
Alloeotomus gothicus		+				
Lopus decolor				+		
Oncotylus viridiflavus			+			
Conostethus griseus		+				
Hoplomachus thunbergi		+				
Tinicephalus hortulanus			+			
Megalocoleus molliculus				+		
———— *pilosus*		+				
Amblytylus nasutus			+			
Macrotylus solitarius			+			
———— *paykulli*			+			
Orthonotus rufifrons			+			
Harpocera thoracica					+	
Tytthus pygmaeus			+			
—— *geminus*		+				
Brachyarthrum limitatum		+				
Phylus palliceps			+			
—— *melanocephalus*				+		
—— *coryli*				+		
Plesiodema pinetellum		+				
Psallus betuleti				+		
—— *ambiguus*				+		
—— *perrisi*					+	
—— *wagneri*			+			
—— *assimilis*			+			
—— *variabilis*			+			
—— *quercus*			+			
—— *haematodes*			+			
—— *flavellus*			+			
—— *lepidus*			+			
—— *falleni*			+			

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Psallus scholtzii			+			
——— *diminutus*			+			
——— *albicinctus*		+				
——— *varians*				+		
Phoenicocoris obscurellus			+			
Compsidolen salicellus			+			
Atractotomus mali				+		
——— *magnicornis*				+		
Plagiognathus albipennis					+	
——— *arbustorum*						+
——— *chrysanthemi*						+
——— *vitellinus*		+				
Chlamydatus pullus			+			
——— *saltitans*			+			
Monosynamma bohemani		+				
Campylomma verbasci			+			
Salicarus roseri			+			
Sthenarus rotermundi			+			
Asciodema obsoletum			+			
Psallodema fieberi		+				
Hallodapus rufescens			+			
Systellonotus triguttatus			+			
Macrolophus rubi		+				
——— *nubilus*		+				
Neodicyphus rhododendri			+			
Dicyphus constrictus		+				
——— *epilobi*					+	
——— *errans*				+		
——— *stachydis*			+			
——— *pallicornis*			+			
——— *annulatus*			+			
——— *globulifer*			+			
Campyloneura virgula				+		
Pilophorus cinnamopterus			+			
——— *clavatus*		+				
——— *perplexus*			+			
Halticus apterus		+				
——— *luteicollis*		+				
Strongylocoris leucocephalus		+				
Orthocephalus coriaceus		+				
——— *saltator*			+			
Malacocoris chlorizans					+	
Fieberocapsus flaveolus		+				
Cyllecoris histrionicus					+	
Dryophilocoris flavoquadrimaculatus				+		
Globiceps flavomaculatus		+				
Heterocordylus genistae		+				
——— *tibialis*				+		
Heterotoma planicornis					+	
Blepharidopterus angulatus					+	
Pachylops bicolor			+			
Orthotylus tenellus		+				
——— *viridinervis*			+			
——— *marginalis*					+	
——— *flavinervis*			+			
——— *nassutus*			+			
——— *ochrotrichus*			+			
——— *prasinus*			+			
——— *ericetorum*				+		
——— *adenocarpi*			+			
——— *virescens*				+		

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Orthotylus tenellus concolor		+				
——— *flavosparsus*				+		
——— *moncreaffi*		+				
——— *diaphanus*			+			
——— *bilineatus*			+			
Pseudoloxops coccineus			+			
Cyrtorhinus caricis		+				
Mecomma ambulans				+		
Pithanus maerkeli				+		
Lygus pratensis		+				
——— *maritimus*			+			
——— *rugulipennis*					+	
Liocoris tripustulatus						+
Orthops rubricatus		+				
——— *cervinus*			+			
——— *viscicola*		+				
——— *campestris*					+	
——— *kalmi*		+				
Lygocoris pabulinus						+
——— *viridis*			+			
——— *populi*		+				
——— *contaminatus*				+		
——— *spinolai*			+			
——— *lucorum*			+			
Camptozygum aequale			+			
Plesiocoris rugicollis				+		
Polymerus unifasciatus		+				
——— *palustris*		+				
——— *nigritus*			+			
Charagochilus gyllenhali			+			
Dichrooscytus rufipennis			+			
——— *valesianus*	+					
Miris striatus		+				
Calocoris quadripunctatus			+			
——— *stysi*					+	
——— *fulvomaculatus*			+			
——— *roseomaculatus*			+			
——— *norvegicus*					+	
Adelphocoris ticinensis		+				
——— *lineolatus*				+		
Megacoelum infusum			+			
——— *beckeri*		+				
Stenotus binotatus					+	
Phytocoris tiliae					+	
——— *populi*			+			
——— *dimidiatus*				+		
——— *longipennis*		+				
Phytocoris reuteri				+		
——— *ulmi*					+	
——— *varipes*					+	
——— *insignis*		+				
Capsus ater					+	
Pantilius tunicatus			+			
Capsodes gothicus			+			
Acetropis gimmerthali			+			
Stenodema calcaratum						+
——— *trispinosum*		+				
——— *laevigatum*					+	
——— *holsatum*		+				
Notostira elongata					+	
Megaloceroea recticornis			+			

	Very rare	Rare	Occasional	Frequent	Common	Abundant
Trigonotylus ruficornis				+		
Teratocoris anennatus		+				
Leptopterna ferrugata					+	
——— *dolabrata*						+
Ceratocombus coleoptratus		+				
Saldula orthochila			+			
——— *saltatoria*			+			
——— *pilosella*		+				
——— *pallipes*			+			
Micracanthia marginalis		+				
Chartoscirta cincta					+	
——— *cocksi*		+				
Mesovelia furcata			+			
Hebrus ruficeps			+			
Hydrometra stagnorum				+		
Velia caprai					+	
——— *saulii*		+				
Microvelia reticulata				+		
Gerris argentatus			+			
——— *thoracicus*				+		
——— *gibbifer*				+		
——— *lacustris*					+	
——— *odontogaster*				+		
Aquarius najas				+		
——— *paludum*		+				
Nepa cinerea					+	
Ranatra linearis			+			
Ilyocoris cimicoides					+	
Aphelocheirus aestivalis		+				
Notonecta glauca						+
——— *obliqua*			+			
——— *viridis*					+	
——— *maculata*			+			
Plea atomaria					+	
Micronecta scholtzi			+			
——— *poweri*			+			
Cymatia coleoptrata				+		
——— *bonsdorffi*			+			
Callicorixa praeusta					+	
Corixa punctata					+	
——— *dentipes*			+			
——— *affinis*		+				
——— *panzeri*		+				
Hesperocorixa sahlbergi					+	
——— *linnei*					+	
——— *castanea*		+				
——— *moesta*			+			
Arctocorisa germari		+				
Sigara dorsalis					+	
——— *fossarum*				+		
——— *scotti*		+				
——— *falleni*					+	
——— *distincta*					+	
——— *lateralis*					+	
——— *nigrolineata*					+	
——— *concinna*			+			
——— *venusta*	+					
——— *semistriata*		+				
——— *limitata*				+		
——— *stagnalis*		+				

As there has been no earlier comprehensive account published on the Heteroptera of the London area before this present series, it is proposed to follow the above summary now with a brief discussion of the major habitats within the Society's limits, indicating those species of plant and water bugs that have occurred in each.

1. WOODLAND

Much of the London area was at one time covered with natural woodland, but with the growth and subsequent expansion of the built-up areas many fragments of this long-established vegetation cover became isolated. In addition to the well-known examples of Epping and Hainault Forests (both in Essex), there are a number of smaller woods that have long persisted, such as Highgate Wood (Harringay), Sydenham Hill Wood (Southwark) – a remnant of the old Great Northwood, Oxleas Wood (Greenwich) and Lesnes Abbey Wood (Bexley). All those just mentioned are oak woods (see below) and have survived primarily because, since mediaeval times, they were carefully managed in order to provide Londoners with essential woodland products.

a) Oak Woodland

As in the remainder of lowland England, oak in the London area is the most important and widespread woodland tree. Oaks are found mainly on the clays and loams which are damp (e.g. London Clay and the Woolwich beds) and the dominant species is the pedunculate oak *Quercus robur.* Oak does not normally grow alone so mixed with it to a varying degree are other tree species including birch, sycamore, hornbeam, hazel, holly, hawthorn (both *Crataegus monogyna* and *C. laevigata*) and less frequently beech (see below) and ash. Bracken, bramble and sometimes bluebell may dominate the ground layer in these woods. Examples of pedunculate oakwoods are: **Middx:** Ruislip, Stanmore, Scratchwood and Ken Wood; **Herts:** Broxbourne, Hoddesdon, Hadley Wood and Hadley Common, Whippendell and Northaw Great Wood; **Essex:** Epping and Hainault Forests, Brentwood and Warley; **Kent:** Darenth and Orpington Woods; **Surrey:** Bookham, Ashstead and Epsom Commons, and on Boxhill (on clay with flints overlaying the chalk); **Bucks:** Langley and Chalfont parks and Black Park, Wexham. Hornbeam *Carpinus betulus* occasionally occurs in oak woods though more frequently to the north of the Thames. At Parndon Wood (Essex) it is still coppiced under traditional management. Hazel *Corylus avellana* on the other hand, is abundant in oakwoods south of the river but comparatively scarce in those situated on the north side. The wild service tree *Sorbus torminalis,* as indicator species of ancient woodland, is found in a few oakwoods in the London area, e.g. in Perivale, Highgate, Shepherdleas and Scratch Woods and at High Beach in Epping Forest. The sessile oak *Quercus petraea,* while occasionally being mixed equally with the pedunculate oak (as in Highgate Wood and Bishop's Wood) is sometimes dominant on the drier sandy soils (as for example at Hampstead Heath and in Joyden's and Lesnes Abbey Woods). Turkey oak *Quercus cerris* has become naturalised on some sandy areas also.

Among the more frequent Heteroptera associated with oakwoods in the London area are:

Palomena prasina
Pentatoma rufipes
Picromerus bidens
Xylocoris cursitans
Loricula elegantula
Empicoris vagabundus
Himacerus apterus
Anthocoris confusus
——————— *nemoralis*
——————— *nemorum*
Campyloneura virgula
Philophorus perlexus

Cyllecoris histrionicus
Dryophilocoris flavoquadrimaculatus
Blepharidopterus angulatus
Deraeocoris lutescens
Harpocera thoracica
Phylus palliceps
——— *melanocephalus*
Psallus perrisi
——— *quercus*
——— *varians*
——— *diminutus*
Campyloneura virgula

Heterotoma planicornis
Orthotylus nassutus
Calcoris quadripunctatus
Megacoelum infusum
Phytocoris tiliae
———— *populi*
———— *reuteri*
———— *ulmi*

Species associated with hazel in these woods are:

Deraeocoris lutescens
Phylus coryli
Compsidolen salicellus
Malacocoris chlorizans
Orthops cervinus
Phytocoris ulmi

b) Beech Woodland

Beech *Fagus sylvatica* grows best on the chalk south of the River Thames where it is frequent along the North Downs ridge and in the Mole and Darent valleys. There are some particularly fine specimens growing in Surrey at Norbury Park and on Boxhill (here mixed with oak, yew, box and sycamore) and at High Elms and Cuckoo Wood near Downe (both in Kent). Beech occasionally grows on gravel soils as in Epping Forest (Monk Wood), Ken Wood and at Pinner. A single example in the London area of a beechwood on the Lower Greensand is known at Limpsfield in Surrey – an occurrence otherwise rare in S.E. England. Perhaps the most famous locality for magnificent beeches is that at Burnham Beeches (Bucks), lying just over the L.N.H.S. boundary. Heteroptera that have been found on beech include:

Anthocoris nemorum
Xylocoris cursitans
Deraeocoris lutescens
Blepharidopterus angulatus
Lygocoris viridis
Phytocoris reuteri
———— *reuteri*

c) Ash Woodland

The London area has no true ashwoods such as occur on the limestone elsewhere in Britain. Ash, however, is frequently found mixed with other tree species (as mentioned above) in oak woodland. As its wind-sown seeds are very viable it may sometimes form almost pure stands of young saplings on the outer edge of such a wood until engulfed by other trees of the perimeter thus helping to extend the woodland. On the lower scarp face of the North Downs scrub ash thickets occur accompanied by other shrubs such as privet *Ligustrum vulgare* and spindle *Euonymus europaeus*. Ash is also frequently found as a tree of parks and in hedgerows (see below). The Heteroptera that may occur on ash include:

Anthocoris confusus
———— *nemorum*
Loricula elegantula
Psallus flavellus
——— *lepidus*
Campyloneura virgula
Blepharidopterus angulatus
Orthotylus tenellus
———— *nassutus*
Pseudoloxops coccineus
Orthops cervinus
Phytocoris dimidiatus

d) Coniferous Woodland

There are also no natural coniferous woods in the London area, but several localities where conifers were originally planted have since become much extended through naturalization. Woodland of this kind found on the Bagshot sands of Esher Common, Oxshott and Ockham heaths is composed of Scots pine *Pinus sylvestris*. Scots pine is also sometimes found in mixed oak woodland as it does, along with sweet chestnut *Castanea sativa*, in Black Park (Wexham), Epping Forest and Joyden's Wood, Wimbledon Common and at a number of other places. Heteroptera characteristic of Scots pine woods are:

Aradus cinnamomeus
Gastrodes grossipes
Elatophilus nigricornis
Acompocoris pygmaeus
Alloeotomus gothicus
Psallus obscurellus
Camptozygum pinastri
Dichrooscytus rufipennis
Megalocoelum beckeri

Pure larch *Larix decidua* woods are not common, but occur sparingly on the chalk, e.g. as on Mickleham Downs. Heteroptera that have been recorded from larch are:

Tetraphleps bicuspis
Dufouriellus ater
Myrmedobia distinguenda
Pityopsallus luridus
Atractotomus magnicornis
Plagiognathus vitellinus

Native yew *Taxus baccata* woods forming very dense shade occur on Boxhill, Mickleham Downs and Norbury Park in Surrey, but this species has also been planted since early times as single trees in churchyards and in parks. No plant bug is known to be associated with this conifer.

Juniper *Juniper communis* has greatly diminished in S.E. England over the last 30-40 years and it is now rare. It is confined to a few localities on the chalk downland in West Kent and in Surrey. Species of Heteroptera that have been found on this coniferous shrub are:

Elasmostellus tristriatus
Dichrooscytus valesianus
Eremocoris fenestratus

e) Birch Woodland

There is much birch in the London area, but this type of woodland is really a seral stage between heathland or felled areas and the climax oakwood reasserting dominance. As it seeds abundantly and the resulting seedlings grow vigorously many of our sandy heaths formerly dominated by *Calluna vulgaris* have, in half a century (in some instances less) become thickets or woodlands of birch. This has occurred on Wimbledon Common, Headley Heath, Oxshott Heath, Addington Hills, Croham Hurst, Chislehurst Common, Keston and Hayes Commons, Hampstead Heath and Stanmore Common. Birch has also become invasive on several commons on the London Clay, e.g. those at Epsom, Ashstead and Bookham. Most birch is of the common species *Betula pendula* but the downy birch *B. pubescens* is sometimes mixed with it. Heteroptera do not as a rule distinguish between the two though perhaps the first species seems the more productive. Birch is the host of many phytophagous species of which the following have been recorded in the London area:

Elasmostethus interstinctus
Elasmucha grisea
Palomena prasina
Kleidocerys resedae
Loricula pselaphiformis
——— *elegantula*
Deraeocoris lutescens
Psallus betuleti
——— *wagneri*
——— *falleni*
Blepharidopterus angulatus
Lygocoris contaminatus
Pantilius tunicatus

2. HEATHLAND AND COMMONS

Heathland in southern Britain is classified as lowland heath (cf. the upland heath of the higher and mountainous zones of northern Britain). That occurring in the London area is usually on fairly open land and on poor, sandy or gravelly soils. Much of this is of the podsol type, acid and often damp. Some heathland, though more especially those just beyond our western boundary, may never have been entirely wooded.

Two types of heathland may be distinguished in the Society's area. The first is referred to as damp heath, being dominated by the cross-leaved heath *Erica tetralix* interspersed with purple moor grass *Molinea caerulea,* Heath rush *Juncus squarrosus* and sometime dwarf gorse *Ulex minor*. The wetter areas may be covered with cotton grass *Eriophorum* spp. and bog asphodel *Narthecium ossifragrum*. Sundews *Drosera* spp. occur on the bare patches between sphagnum moss *Sphagnum* spp. which cover much of the water-logged peaty soil beneath. Examples of damp heathland are found on Esher Common, Oxshott Heath, the boggy parts of Wimbledon Common and Keston Common, and just beyond our western boundary on Horsell and Chobham commons. Heteroptera found on damp heathland include:

Neottiglossa pusilla
Drymus brunneus
Nabicula flavomarginatus
Stenodema calcaratum
Megaloceroea recticornis
Chartoscirta cocksi (in bogs)
Rhacognathus punctatus (in *Sphagnum*)
Saldula pallipes (in moss with *Drosera*)

The second type of heathland is termed dry heath, being dominated by common ling or heather *Calluna vulgaris* and common heath or bell heather *Erica cinerea*. Expanses of common gorse or furze *Ulex europaeus* or sometimes bilberry *Vaccinium myrtillus* may also be present. Many of the heaths formerly occupied by this dry heath vegetation have suffered over the years by much public trampling, repeated heath fires or alteration in their use. The *Calluna* in many instances has become replaced by bracken *Pteridium aquilinum* and rosebay willow-herb *Chamaenerion angustifolium* and then succeeded by birch woodland (see above) occasionally with a few pines, originally planted, but since increased from self-sowing. Examples of dry heathland, some still open, others now progressed to the birch woodland are found at Hampstead Heath, Walton Heath, Headley Heath, Reigate Heath, Limpsfield Chart, Wimbledon Common, Putney Heath, parts of Epping Forest (notably the Chingford Plain), and on Chislehurst, Hayes and Keston Commons. Heteroptera common or frequent on dry heaths in the London area include:

Rhopalus parumpunctatus
Kleidocerys resedae
———— *truncatulus* subsp. *ericae*
Peritrechus geniculatus
Megalomotus chiragra
Stygnocoris sabulosus
Ischnocoris angustulatus
Scolopostethus decoratus
Coranus subapterus
Nabis rugosus
—— *ericetorum*
Aptus mirmicoides
Anaptus major
Stalia boops
Hallodapus rufescens
Saldula orthochila

Many of our 'commons' (i.e. areas of land on which, in the past, village commoners held certain rights) have often been derived from nearby dry heath. The grazing of domestic animals by the villagers on the heathland over many generations has caused its former cover of gorse and heather to be replaced by open grassland. Later, with the falling into disuse of the villagers' rights, a further change has taken place with the transition of the grassland to scrub, such as that seen today on Barnes and Wimbledon Commons. Some older commons nearest to London's centre were lost to the pressures of urbanization while others have become more park-like with almost all undergrowth removed (e.g. as on Blackheath, and Clapham, Tooting and Wandsworth Commons) and parts converted to playing fields. While still retaining some element of wild life they no longer exhibit the characters usually associated with a heathland habitat.

3. GRASSLAND (INCLUDING MEADOWS)

There are various species of Heteroptera found amongst different grasses which occur both on the open grassy areas of the heaths and commons mentioned above and also in meadows, i.e. fields that may be grazed, but not regularly ploughed and therefore have a mixed flora with plant species surviving the sword for a number of years. In the Society's area there remain a few old riverside meadows mainly on alluvial soil which were either flooded from a nearby river through sluices, or because they were low lying become naturally flooded during wintertime. Examples of these are at Rye and Munsden Meads and a few along the River Colne (all in Herts); by the River Mole and at Egham and Chertsey by the Thames (all in Surrey); and by the River Darent in Kent. London area bugs frequently common in all types of grassland include:

Myrmis miriformis
Nabis flavomarginatus
—— *ferus*
Nabicula limbatus
Lopus decolor
Phytocoris varipes
Capsus ater
Stenodema calcaratum
———— *laevigatum*
Trigonotylus ruficornis
Leptopterna dolabrata

4. HEDGEROWS AND HEDGEBANKS

Hedges have been formed ancestorily from strips of woodland left when the ground was cleared by early man for cultivation. They served to identify boundaries between land farmed by different owners. Typically, in the London area, a hedgerow is dominantly formed of hawthorn and/or blackthorn interspersed with scrub oak, sapling elm, hazel, holly, dogwood and field maple, though its exact composition varies according to locality and the drift geology. Although it is considered that more than 140,000 miles of hedges have been uprooted and destroyed since 1945 (quoted by Wilkinson, Fitter and Fitter 1984: 18) due to modern agricultural practice, the effect of such action is perhaps more visually evident in East Anglia than in the counties immediately around London. With this enormous reduction to the habitat there is undoubtedly far fewer niches available in which insect populations may maintain themselves, but it is not known what direct effect hedgerow clearance has had in the London area on any species of Heteroptera. In the outer zones of the Society's area there are still a remarkable number of hedgerows and hedgebanks. The following is a list of species, associated with them on leaves, flowers or in the leaf litter beneath:

Palomena prasina
Piromerus bidens
Coreus marginatus
Peritrechus lundi
Taphropeltus contractus
Oncotylus viridiflavus
Atractotomus mali
Dicyphus stachydis
Calcoris sexguttatus
——— *fulvomaculatus*
——— *norvegicus*
Stenotus binotatus
Phytocoris varipes

5. AGRICULTURAL LAND

There still exists a large number of farms in London's outer zones with a considerable acreage under cultivation both with traditional crops and market garden produce. There are also areas of fruit-growing particularly in Kent, Middx. and to a lesser extent in parts of Essex. Heteroptera recorded in the Society's area in field cultivations, orchards, market gardens, haystacks and straw, and farm buildings have been:

Peritrechus lundi
Stygnocoris fuligineus
Taphropeltus contractus
Empicoris culiciformis
Lyctocoris campestris
Xylocoris galactinus
Dufouriellus ater
Lopus decolor
Pilophorus perplexus
Malacocoris chlorizans
Orthotylus ochrotrichus
Lygocoris pabulinus
——— *viridis*
Plesiocoris rugicollis
Stenotus binotatus
Phytocoris dimidiatus
Stenodema calcaratum

6. PARKS AND GOLF COURSES

London has numerous parks, not only those now surrounded and otherwise isolated in the centre of the metropolis, e.g. Hyde Park, St James's Park, Regent's Park, and many smaller ones, but also an increasing number as one radiates outward through the zones beyond. The characteristic feature of most of the latter is the almost total absence of any natural scrub or undergrowth as opposed to planted shrubberies, due to its removal either by man himself or, in the past, through the grazing of his animals. Well-spread groups of mature trees have, however, been left creating a pastoral effect but differentiating it from ordinary pasture land. Most of the larger parks formerly belonged to country estates, e.g. in **Kent:** Greenwich Park, Danson Park, Scadbury Park, Sundridge Park and Lullingstone Park; in **Essex:** Bedford Park and Thorndon Park; in **Middx:** Osterley Park, Syon Park and Bushy Park; in **Surrey:** Richmond Park and Morden Hall Park; and in **Bucks:** Langley Park and Ditton Park. Richmond Park, once a Royal hunting park, extends for well over 2,000 acres with undulating grassland, wooded enclosures, clumps of venerable old oaks, areas of bracken and a series of large ponds. As Davis (1978) points out, such parks, however, 'make an important contribution to the biological diversity of insect fauna'. In such built-up areas they certainly maintain a reservoir of species which can then fly to other smaller parks and gardens elsewhere in London.

Like the parks the many golf courses in the Society's area, particularly in the outer suburbs, provide open areas not only for recreation, but as havens for wildlife. The hawthorns left in the roughs together with occasional mature trees all provide potential sites for insect survival.

As might be expected the heropterous fauna of parks (particularly those that have some portion of the grassland mown less often) and golf courses, is similar to that found on heaths and commons. Some of the species most likely to be encountered are:

Elasmucha grisea
Palomena prasina
Nabis rugosus
Monalocoris filicis
Deraeocoris lutescens
——— *ruber*
Psallus perrisi
Plagiognathus albipennis
——— *arbustorum*
——— *chrysanthemi*
Cyllecoris histrionicus
Heterotoma planicornis
Blepharidopterus angulatus
Orthotylus marginatus
Lygus regulipennis
Liocoris tripustulatus
Orthops compestris
Lygocoris pabulinus
Calocoris norvegicus
Stenotus binotatus
Phytocoris tiliae
Capsus ater
Stenodema calcaratum
——— *laevigatum*
Notostira elongata

7. GARDENS AND ALLOTMENTS

In addition to the parks and golf courses the gardens of private households and allotments in London's suburbs also form in themselves a valuable resource for the maintenance and continuance of many insect groups, including Heteroptera. Some species of plant bugs that have been found in these habitats (this list being by no means exhaustive) include the following:

Scolopostethus thomsoni
Taphropeltus contractus
Anaptus major
Orius niger subsp. *compressicornis*
Bryocoris pteridis
Deraeocoris ruber
Orthotylus ericetorum
Calocoris norvegicus

The garden of Buckingham Palace, though somewhat larger than the gardens referred to above, has had, in spite of its position in Central London, some 27 species of Heteroptera recorded from its grounds during 1960-62. Less than two miles away the Chelsea Physic Garden, though considerably smaller has yielded 21 species of bugs (see map). Both these totals while not large are interesting in that they represent individuals from populations of Hepteroptera that may have persisted within these 'walled oases' for over 300 years even though London's spread long since engulfed them.

8. WASTELAND

Just as the parks, golf courses and gardens provide areas for the establishment of insects within London, so too do the various waste lands, including roadsides, railway embankments, sides of motorways, neglected cemeteries, derelict plots and rubbish tips. Such areas become invaded by many plant species on which Heteroptera may feed or are hosts of their prey. Little work has yet been done on investigating the Heteroptera of waste areas. However, during a two-year entomological study done by the present author during 1956-57 (Groves 1959) on an area of derelict basement sites at Cripplegate, City of London (the original buildings of which had been bombed during World War II) turned up 17 species of Heteroptera. The study could not be continued because the area was to be cleared for rebuilding, but had this been possible no doubt the list could have been much extended. A similar investigation on the Diptera of the same area but started some six years earlier, produced a remarkable total of over 200 species (Parmenter 1954), clearly indicating how soon such waste lands, even in the heart of the city, can be colonized by plants followed soon afterwards with the arrival of insects. There are several sites used for dumping some of London's waste material along the north side of the Thames, particularly at Rainham, Dagenham and Barking. Parts of these sites have become colonized by numerous ruderal and adventive plants, later often suceeded by woody perennial species. An investigation of their heteropterous fauna, indeed for any insect group (after permission has been sought from the land-owners concerned) would amply repay time spent on such a study. Species recorded as abundant, common, frequent or occasional on wasteland in the London area have been:

Aelia acuminata
Coreus marginatus
Stynocoris fuligineus
Scolopostethus affinis
Taphropeltus contractus
Cymus claviculus
Berytinus crassipes
——— *montivagus*
Tingis ampliata
Aptus mirmicoides
Nabicula limbatus
Orius majusculus
—— *minutus*
—— *niger* subsp. *compressicornis*
Monalocoris filicis
Deraeocoris ruber
Amblytylus nassutus
Chlamydatus saltitans
Orthocephalus saltator
Stenotus binotatus
Phytocoris varipes
Stenodema calcarata
Leptopterna ferrugata
——— *dolabrata*
Saldula orthochila

9. FRESHWATER MARSHES AND SALT MARSHES

In former times there existed many areas of freshwater marsh at the sides of the River Thames (particularly in the upper reaches) and its tributaries, but as the demand for building land increased with London's expansion most of such marshland has long since been drained, filled in and built over. The few areas that remain include those at Hackney and Walthamstow, the marshes at Harlow and at Sawbridgeworth, and the Ingrebourne marshes. All of these still have good reed beds typical of such a habitat. Species of Heteroptera likely to be found in a freshwater marsh are similar to those occurring in canals (q.v., p. 173).

Towards the Thames estuary and lying either side of the river are the remnants of what were at one time extensive salt marshes. Large areas of these have, in the past fifty years, been much modified by man, first through drainage and embankment, then by use for industrial purposes (cement works, motor works, petroleum works, etc.), isolation hospitals, rubbish tips and to a lesser extent for allotments and grazing. The most recent development has been the building of the large Thamesmead housing estate on what was part of the old Woolwich Arsenal site and Plumstead marshes. There are, however, still parts of these Thames-side salt marshes that exhibit elements of such habitats, e.g. intertidal mud-flats and shingle covered in part by a characteristic saline flora, and therefore remain of considerable interest from the entomological point of view. Within the Society's area and lying on the north bank of the river (i.e. the Essex side) are the marshes of Hornchurch, Rainham, Wennington, Aveley, West Thurrock, Little Thurrock and Tilbury. On the south bank (Kent side) lie the marshes of Greenwich, Erith (= Abbey Wood marshes), Crayford, Dartford, Stone and Swanscombe. Species of Heteroptera, some considered rare, that have been recorded from these marshes include:

Conostethus griseus
Orthotylus moncreaffi
Phytocoris varipes
Stenodema trispinosum
Saldula pilosella
Notonecta glauca
——— *viridis*
Callicorixa praeusta
Corixa affinis
——— *panzeri*
Hesperocorixa sahlbergi
——— *linnei*
Sigara dorsalis
——— *fossarum*
——— *lateralis*
——— *stagnalis* (old record)

10. RIVERS

The River Thames, as can be seen from the map (pp. 156-7) divides the L.N.H.S. area into approximately two halves – a northern half and a southern half. It enters our western boundary at Runnymede, meandering at first southwards, past

Shepperton and Hampton Court, then turning northwards passing Richmond, Kew, Hammersmith and Chelsea before flowing eastwards through the City, along by Greenwich and the marshes described in the previous section, to leave the eastern boundary just west of Tilbury and Gravesend. Both sides of the river have attracted much industrialisation so it is not surprising, therefore, that its waters remained polluted for many years. However, by local legislation, frequent inspection and, above all, public awareness of the need for change, the cleaning up of the Thames in the last few decades is a story of remarkable achievement. As this has been well documented (Doxat 1977, Harrison & Grant 1976 and Wheeler 1979) no useful purpose would be served in this present paper by elaborating further on this aspect of the river's history. The flow of the Thames is tidal up to the weirs at Teddington lock, near Richmond, but its speed is unsuited for colonisation by the aquatic Heteroptera (the Amphibicorisae and Hydrocorisae) though they may be found in many of the slower reaches of its tributary rivers and streams.

The main tributary rivers of the Thames within the L.N.H.S. circle are: **Middx.:** the Crane which flows into the Thames at Isleworth (having in addition a man-made portion called the Duke of Northumberland's River which enters just north of its main confluence) and the Brent which enters the river at Brentford, opposite Kew Gardens; **Herts.:** the Colne flows for its most part through this county though it enters the Thames at Staines (formerly Middx. now administratively in Surrey); **Essex:** the southern part of the county has five rivers viz. the Lea entering at Bugsby Reach via Bow Creek, the Roding entering via Barking Creek, the Beam joining the Thames just east of the Ford Motor Works at Dagenham, the Ingrebourne flowing via Rainham Creek, and finally the Mardyke which enters at Purfleet; **Kent** is represented in our area by two rivers, the Darent (with its subsidiary the Cray) flowing into the Thames via Dartford Creek and the Ravensbourne (with its subsidiary the Quaggy) entering via Deptford Creek. **Surrey** has four main rivers and two minor ones. The river Wey enters the Thames at Weybridge, the Mole at East Molesey, the Hogsmill at Kingston opposite Hampton Court Park, and the Wandle entering at Wandworth. The minor rivers are the Beverley Brook which after flowing through Richmond Park enters the Thames at Barnes, and the River Bourne which enters at Chertsey. Other rivers, or parts of rivers, that also lie within the 20-mile radius of St Paul's Cathedral include the tributaries of the River Colne (viz. the Misbourne, Chess, Gade and Ver), a small part of the River Rib and River Stort (all in Herts.), and in Surrey, there are some upper streams of the Eden Brook which rise below Godstone, Limpsfield and Westerham, then flow out of our boundary southwards to join the River Eden in Kent. Eventually they enter the Thames at Rochester via the River Medway.

There is still much work to be done in studying the aquatic Heteroptera in all reaches of the tributaries mentioned above, particularly in regard to why some species are present in parts of their waters yet not in others seemingly similar. The list appended here could be much increased by such investigation:

Dictyla convergens
Mesovelia furtata
Velia saulii
Gerris lacustris
Aquarius najas
Aphelocheirus aestivalis
Plea atomaria
Micronecta scholtzi
Micronecta poweri
Callicorixa praeusta
Sigara dorsalis
——— *falleni*
——— *distincta* (old record)
——— *lateralis*
——— *concinna* (old record)

11. STREAMS AND FLOWING DITCHES

Scattered throughout the London region are many streams and flowing ditches which, like rivers just described, have also suffered with pollution from adjacent industrial sites and the unofficial dumping of assorted rubbish. Some of these streams and ditches are permanent while others tend to dry up during the summer months. Those that are permanent are the ones most likely to be colonized by aquatic Heteroptera. Certain species prefer a detritus cover to the bottoms of such streams and ditches; others are found where it is gravelly or sandy and clean. Yet again some are present only where there is weed and to others this appears to be less essential. The following species have been noted from streams and flowing ditches, though this list, like that under the previous section, could be added to with further work:

Dictyla convergens
Hebrus ruficeps
Saldula saltatoria
Hydrometra stagnorum
Velia caprai
Gerris thoracicus
—— *lacustris*
Ilyocoris cimicoides
Aphelocheirus aestivalis
Notonecta glauca
Plea atomaria
Corixa punctata
Hesperocorixa linnei
Sigara falleni

12. CANALS

There are two major and one minor systems of waterways in the Society's area. The first is the Grand Union Canal which commences in Paddington Basin (with the Regent's Canal arm joining it soon afterwards at Warwick Avenue). It then makes a sinuous course westward to Southall where it joins another branch that has come up from Brentford. Together these continue as one westwards to Yiewsley, south of Uxbridge, where it forks, the western arm proceeding to Slough while the main branch continues northwards and parallel to the River Colne, leaving the L.N.H.S. northern boundary just beyond King's Langley to continue its journey to either Aylesbury or the Midlands. The second is the Lee Navigation* which flows to Hertford and begins with part of its way in the same bed as the River Lea in Essex while at other sections en route it has its own straight course. At Rye Meads there is a fork; the branch to the north-east (now being called the Stort Navigation) carries water traffic on to Bishop's Stortford. The main branch of the Lee Navigation continues northwards to Ware and Hertford. The lesser system is the Wey Navigation (Surrey) which begins at its lock with the Thames west of Weybridge and continues along the west side of the River Wey but separate from it. It soon leaves the L.N.H.S. boundary at its fork with the Basingstoke Canal just south-west of Byfleet railway station.

Though not continuous in flow as in a river, there is a certain amount of water movement to and fro in canals due to the passage of traffic between, and in and out of, the locks. The Heteroptera fauna has therefore not only certain similarities with those of rivers, but also some affinities with those lakes as described in the next section. Species recorded from some of the canals mentioned have been:

Microvelia reticulata
Gerris gibbifer
—— *odontogaster*
Aquarius najas
——— *paludum*
Notonecta glauca
Micronecta scholtzi
Cymatia bonsdorffi
Hesperocorixa sahlbergi
————— *linnei*
Sigara dorsalis
—— *falleni*
—— *distincta*

13. LAKES AND PONDS

There are no true lakes in the London area as found in the upland regions of Britain such as in the Lake District and parts of Scotland. There are, however, a number of large ponds which often have had the term ‘lake’ incorporated in their name. These are situated either in large parks, estates or in open fields. Those with deep water and some wave action (due to wind blowing across the larger expanse of surface) support ‘a few species that are specific though such lakes share even more with the smaller ponds’ (Richards 1964). Heteroptera recorded in these so-called lakes have been:

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*The term 'navigation' is, strictly speaking, applied to a waterway of a natural river (or part of same) that has been adapted to make it navigable, whereas the waterway in a true canal has been man-made for its entire length. Local use, however, is often less discriminate and both types may get called 'canals'.

Microvelia reticulata
Gerris odontogaster
Nepa cinerea
Ilyocoris cimicoides
Notonecta glauca
——— *viridis*
Plea atomaria
Micronecta scholtzi
Micronecta poweri
Callicorixa praeusta
Artocorisa germari
Sigara dorsalis
——— *fossarum*
——— *falleni*
——— *distincta*
——— *concinna*

Small ponds still form by far the most numerous of the aquatic habitats in the L.N.H.S. sphere of interest, though a large number have been lost due to infilling or drainage. Recent action by conservation bodies has, however, gone a long way to halt this trend and in some localities has restored many to their original state. Though no doubt losses to aquatic Heteroptera have occurred, it is difficult to say without precise data what the effect may have been on individual species. One generalisation, however, can be made with regard to the drop in numbers of three easily recognised water bugs – the water stick insect *Ranatra linearis*, the water scorpion *Nepa cinerea* and the water measurer *Hydrometra stagnorum*. Forty or fifty years ago these three species were present in almost every field or village pond. Now they are much less common and in some localities no longer present. This situation is due, not to over collecting, but to the reduction in the number of suitable sites in which these bugs can reproduce.

Two types of small pond may be recognised within the Society’s area a) the oligotrophic, and b) the eutrophic. Oligotrophic ponds contain water that is markedly acid, often stained brown and lined with peat, and may be fringed with *Sphagnum* mosses. They are found on heathland mostly to the south and west of London (see under Section 2) and have a marked nutrient deficiency. Such conditions support little or no aquatic vegetation and only a depauperate fauna. Heteroptera that have been recorded in such ponds in the London area include:

Chartoscirta cincta
Hebrus ruficeps
Gerris gibbifer
Ilyocoris cimicoides
Notonecta obliqua
Hesperocorixa castanea
——— *moesta*
Sigara scotti

Eutrophic ponds on the other hand are slightly acid, neutral or alkaline, contain no peat and have varying amounts of dissolved nutrients, some containing more than others. This type of pond, often with submerged or emergent vegetation, is found in fields and open woodland and village ponds are also usually in this category. Such ponds support many Heteroptera species and some of the more common of these that have been recorded in the London area are:

Saldula saltatoria
Hydrometra stagnorum
Gerris thoracicus
——— *gibbifer*
——— *lacustris*
Nepa cinerea
Ranatra linearis
Ilyocoris cimicoides
Notonecta glauca
——— *viridis*
Plea atomaria
Micronecta poweri
Cymatia coleoptrata
Callicorixa praeusta
Corixa punctata
Hesperocorixa sahlbergi
——— *linnei*
Sigara dorsalis
——— *falleni*
——— *distincta*
——— *lateralis*
——— *nigrolineata*
——— *concinna*

14. RESERVOIRS AND GRAVEL PIT POOLS

Most of the reservoirs in the London area administered at present by the Thames Water Authority contain water essentially for human consumption and as such must be kept reasonably free from too much contamination. They all have concrete bases and apart from marginal algae are kept free of water-weed growing in or on the water. Fish are introduced to some of these reservoirs and fishing is permitted in season. Although the attraction to birds particularly winter migrants, is quite considerable few, if any, water-bugs are found in their waters apart from an occasional specimen of *Notonecta maculata* (also occurring in concrete garden ponds) which has been found in the stomachs of various fish. On the other hand there are some reservoirs, that prove more attractive to aquatic insects, being built originally to maintain the water level in some of London's canals. Three that have survived are Aldenham (Elstree) Reservoir, Brent Reservoir ('Welsh Harp') and Ruislip Reservoir, all with soil substrates and comparatively shallow water with reed beds. Portions of each of these reservoirs have been given over to wild life and a study on the northern end of Ruislip Reservoir, now a Nature Reserve, recorded 129 species of Heteroptera (Groves, 1965).

Gravel, required more and more in concrete, for today's building has necessitated an increasing number of sites being opened up for its extraction. When such extraction becomes no longer profitable the pits are abandoned, some being used as tips for town refuse, while others are left to fill over the years with rain. It is these newly-created water habitats that have gone some way to redress the balance after the loss of so many other natural wetlands. Apart from the wealth of bird life present all the year round, a natural succession of vegetation soon develops around the margins which provides potential niches for colonisation by terrestrial Heteroptera. However, such sites are attractive to the water species only if they have at least one gradual sloping part at their sides and water that is not too deep. One such abandoned pit, now taken over by the Kent Naturalists' Trust, is Ruxley Gravel Pit near Chislehurst from which 27 species of Heteroptera have so far been recorded and undoubtedly more will be found in the future. Other pits at which records have been made include some in the Colne Valley (Stockers Lake), the Lea Valley (Rye Mead and Broxbournbury), at Datchet and at Radlett. Species of both land and water Heteroptera that have been found at some of London's gravel pits include:

Megalonotus chiragra
Cymus glandicolor
Berytinus minor
Megalocoleus pilosus
Saldula pallipes
Microvelia reticulata
Gerris thoracicus
——— *gibbifer*
——— *lacustris*
——— *odontogaster*
Notonecta glauca
——— *viridis*
Cymatia coleoptrata
Corixa punctata
Hesperocorixa linnei
Sigara dorsalis
——— *falleni*
——— *distincta*
——— *nigrolineata*
Coriomeris denticulatus

15. SEWAGE FARMS AND DISUSED WATER-CRESS BEDS

All the older sewage farms in the London area were organised on the wet-field principle. In this, after separation of the solid matter in the settlement pits, the liquid material was allowed to flow through a series of open grass fields to be purified by soil bacteria before being returned to nearby rivers. With the population increase, the amount of sewage that now had to be dealt with daily required a more rapid method of treatment. During the period 1950-60 most of the old works were modernized, but at a few farms the original settlement pits were not demolished and these have been left alongside the new plant. One such sewage farm along the Lea Valley has been studied over a number of years by B. S. Nau who has found many Hydrocorisae in the rain water that still collects in the old open pits and adjacent channels.

Disused water-cress beds, with their shallow water troughs, often overgrown with other water weeds, are also well worth examining for water-bugs. Such beds occur at West Hyde, Rye Meads and Lemsford Springs, all in Herts.

The following list includes the common species that have been found at old sewage farms and those indicated with an asterisk have also been taken in disused water-cress beds:

Gerris thoracicus
——— *lacustris*
——— *odontogaster*
Notonecta glauca
Callicorixa praeusta
**Hesperocorixa sahlbergi*
Hesperocorixa linnei
**Sigara dorsalis*
*——— *fosscorum*
*——— *falleni*
——— *lateralis*
——— *nigrolineata*

16. DISUSED CHALK QUARRIES AND SAND PITS

In numerous places, especially along the North Downs in Kent and Surrey, are small chalk quarries, long since abandoned that are found both on the scarp face and on the dip slope (i.e. north side). Along the scarp these quarries coincide with the line of the Pilgrim's Way and the boundary of the Middle Chalk. The foot of the slopes would have been easier for extraction but the Middle Chalk bed was preferred because of its more pure and whiter chalk which made not only good lime for the land but also excellent whitewash for walls. Quarries on the dip slope were dug into the Upper Chalk and provided numerous bands of flints and soft limestone for mortar, both used in the building of cottages. The floors and sides of these old quarries have become clothed with sparse vegetation including many plant species no longer found on the surrounding downland. They also act as refuges for certain insects scarce elsewhere. Well-known abandoned chalk quarries occur at Swanscombe and Gt Culand (just beyond our area) both in Kent and at Grays in Essex, all now Nature Reserves. Several Heteroptera, some rare, that have been recorded from disused chalk quarries include:

Ceraleptus lividus
Bathysolen nubilus
Eremocoris podagricus
Sciocoris cursitans
Kalama tricornis
Systellonotus triguttatus
Podops inuncta

As with gravel, the rights for extraction of sand are granted under licence for a certain term. A sand-pit may be abandoned either because it has become worked out or the authorities may not have extended the firm's licence to continue digging. Disused sand-pits are very acid and colonization by grasses and small herbs takes some years, and the establishment of insects is correspondingly slow to follow. Nevertheless, old sandpits are always worth examining and some of the Heteroptera that have been found in such sites have included:

Ceraleptus lividus
Rhopalus parumpunctatus
Stygnocoris fuligineus
Piesma quadratum
Kalama tricornis
Chlamydatus pullus
Calcoris roseomaculatus
Plinthisus brevipennis

Space does not permit discussion of microhabitats, most of which lie within, and form part of, the larger ones just described. Heteroptera occurring in a smaller habitat may not necessarily be specific to it (except in the case of those occurring in birds' nests) but most often represent the same species as found in other niches within the parent habitat.

To conclude, no one is more concious than the present author of the gaps in our knowledge of the distribution of Heteroptera in the London area, even for some of the common species. This could easily be rectified if some of the newer generation of entomologists will take up the study of this group. It is hoped that this series of papers will provide them with a baseline on which changes can be monitored, and for the future, after a lot more field work and recording, a distribution atlas for London's Heteroptera might then be produced.

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Book Review

Sharks of the World. By Rodney Steel. Blandford Press, Poole. 1985. 192pp. £10.95. ISBN 0 7137 1425 5.

Sharks are a fascinating group of fishes, and this is another one of the many popular books that have been written about them. The author endeavours to cover aspects of the biology, natural history and evolution of sharks but the result is disappointing. In many places, the text is muddled and difficult to follow, facts are often repeated several times but more important, some of the information is misleading.

Throughout the book, it is stated that the sense of smell is of prime importance to sharks hunting for prey but little emphasis is placed on the ampullae of Lorenzini, or electro-receptive pits. These pits can detect a minute electric current, equivalent to the discharge released by a nerve impulse from a potential victim, enabling a shark to locate prey buried in the substrate or at some distance.

The evolution of sharks is tackled in some detail but it is a pity that more care was not taken with the phraseology. In a chapter entitled 'Ancestors from ancient seas', the author tells us that during the Cretaceous the hybodont sharks became 'outdated' relics unable to compete with 'new generations' of sharks and deprived of sufficient food owing to widespread extinctions of invertebrates. There were massive extinctions in all animal phyla during this period, the causes of which are unknown, thus the reasons given for the demise of the hybodonts are very naïve. In the same chapter, the author states that the teleosts are the most advanced of all bony fishes, an unforgiveable error as the teleosts *are* the bony fishes. The cartilaginous skeleton of sharks is described as a 'degenerative specialisation'. The so-called 'cartilage skeleton' is a specialised hard tissue, typical of the elasmobranchs, which elegantly fulfils its role of supporting the body without materially adding to its weight, and can in no way be regarded as degenerate.

'Experiments in evolution' is a phrase used as the title of a chapter and which also appears elsewhere in the book. The term 'experiment' is inaccurate as it implies that the evolution of organisms is both controlled and directed. That evolution has occurred is evidenced by the fossil record but there are no data to suggest evolution is experimental. Similarly, the frequent and incorrect use of the word 'aberrant' for a character that is unique, for example the thresher sharks' tail is described as such, is unfortunate, as this word is usually used to describe a deformity. Elsewhere in the book a number of technical and medical terms are used that do not appear in the glossary but would have benefited from inclusion.

Those chapters describing the biology of sharks are poor. The reader is informed that sharks must keep moving in order to respire. They do have a limited muscular control of the branchial arches but sharks have been observed resting on the substrate and undoubtedly, the oxygen demand for a resting shark is very low.

The section on osmosis is very confused and does not adequately explain this phenomenon. A semi-permeable membrane facilitates the passage of selected ions, not molecules, to maintain osmotic equilibrium, and size is not the main criterion governing their passage.

The reproductive organs are not combined with the urinary system despite the statement to the contrary in this book. The rectum, ducts from the kidneys and reproductive organs open into the cloaca, an opening situated near the junction between the trunk and tail regions of the body.

The redeeming parts of the book are those concerned with the natural history of sharks and the illustrations, although the section on humans attacked by sharks makes for sanguinary reading.

BERNICE BREWSTER

The Bush-Crickets of Thamesmead

by Patrick English*

The History of the Habitat

Thamesmead is situated in the south-east of London, beside the tidal Thames and still has remnants of its original marshland, providing habitats for a rich variety of wildlife. Although Thamesmead New Town is now in its final development stages, areas beyond the housing estates still have populations of short-winged cone-head, Roesel's and great green bush-crickets. These species occur locally in London and their presence together at Thamesmead is therefore significant.

The Thamesmead area has the last surviving grazing marsh and saltings this far up the Thames. Originally the whole Crossness Peninsula was saltmarsh, but successive rivershore embanking converted this to freshmarsh pastureland. Such riverwall construction was certainly begun in the 13th century by the monks of nearby Lesnes Abbey and there is evidence that the Romans may have begun this land reclamation near Plumstead.

From the Napoleonic Wars, much of the Plumstead and Erith Marshes were used as military ranges and after the Crimean War a complex of moated ammunition magazines was constructed. During the 1860s Crossness Sewage Works was first developed and it has since extended over much of the Erith Marsh. Both these land uses excluded the urbanisation suffered by neighbouring riverside areas.

Following the post-war closure of the Woolwich Arsenal Ranges, the area was left to revert to wilderness. However, this left the land available for large scale building development, and in the mid 1960s Thamesmead New Town was started. Today most of the original marsh and scrubland has been built on. Now those remaining areas occupied by such vulnerable wildlife as bush-crickets, offer the last chance to save something of the original natural environment.

The Status of Bush-Crickets at Thamesmead During 1985

Great green bush-cricket *Tettigonia viridissima*

Great green bush-crickets are common and widespread, extending from the Railway Station and Norman Road, Belvedere, throughout the East Thamesmead Marshes, Crossness Sewage Works and the rivershore at Halfway Reach and Crossness. It is interesting to find that they are increasingly moving into Thamesmead Town, via shrubberies along the Eastern Way and the edge of Southmere and Crossway Parks. Payne (1958) stated that this species appeared to be confined to the vicinity of the Thames marshes.

Great green bush-crickets become obvious during the summer, due to their chirping choruses, starting from the late afternoon and continuing until midnight. They are active from June to October, being most abundant from late July to early September. These crickets can be found in bush thickets and rank herbage. Silent females are difficult to locate, but the chirping males reveal themselves, though they keep low in cover until nightfall. After dark, many can be seen out on bushtops under street lights alongside the Eastern Way.

Due to restricted access, I was unable to visit the Woolwich Arsenal Ranges often enough and so cannot fully report their status there. But, as no great green bush crickets were found during my few visits, I assume that they do not occur, or are very scarce in West Thamesmead.

Ordnance Survey grid references for areas occupied by great green bush-crickets: TQ 4979 complete area, TQ 4980 complete area, TQ 4879 complete

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area, TQ 4880 complete area, TQ 4881 complete area, TQ 4780 complete area, TQ 4781 complete area.

ROESEL'S BUSH-CRICKET *Metrioptera roeselii*

This species is most typical of estuarine marshland (Payne 1958) and the fact that they still survive at Thamesmead reveals the area retains something of such habitats. Roesel's bush-crickets occur in East Thamesmead, along the riverbank and foreshore at Crossness and Halfway Reach Bay, about Crossway Lake and in Crossness Wood. At West Thamesmead and the Woolwich Arsenal Ranges, some were found on unkempt verges of the Central Way near Thamesmere and on embankments of The Maze and Twin Tumps.

Roesel's bush-crickets seem to occur in colonies, somewhat isolated from each other. They are found in sheltered sunny places amongst long grass and herbage. At Crossness and the Halfway Reach rivershore they occurred in thickets of sea aster *Aster tripolium*. Generally, they tend to prefer sparser vegetation than the great green bush-cricket. Roesel's bush-crickets were found from July to mid-October, being most abundant in August and September. They are active during the day and first part of the night, particularly in warm weather. Males can be located by their soft buzzing stridulations and can sometimes be closely approached when sunbathing in the open.

Ordnance Survey grid references for areas occupied by Roesel's bush crickets: TQ 456808, TQ 462809, TQ 478815, TQ 481811, TQ 482808, TQ 493809.

SHORT-WINGED CONE-HEAD BUSH-CRICKET *Conocephalus dorsalis*

This species occurs in marshland areas and represents another bush-cricket that survives in Thamesmead only because a few patches of suitable habitat remain. Payne (1958) stated that this species also was apparently confined to the Thames marshes.

Short-winged cone-heads are more habitat selective than the two previous species, normally requiring well-vegetated damp places, such as the vicinity of ponds, reedswamp and saltmarsh. At Thamesmead they are probably scarce and local. At present, the only known site is a polluted and overgrown ditch along Woodland Way, East Thamesmead. Several stridulating males were located here on occasions during August and September. Locally there are other apparently suitable places, such as Crossway Lake, the Twin Tumps and the swamp on the south eastern boundary of Crossness Sewage Works. Further study of these sites may find more small colonies of cone-heads.

To locate a short-winged cone-head is an achievement in itself, for unlike the Roesel's and great green, their whirring stridulations are very faint and difficult to hear. Those found in Woodland Way were only discovered by listening carefully and at close range. Here the buzzing males were active during warm sunny weather.

Ordnance Survey grid reference for areas occupied by short-winged cone-head bush-crickets: TQ 485797.

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Survey of Bookham Common:

FORTY-FOURTH YEAR
Progress Report for 1985

General (G. Beven*)

We are grateful to the Director and Alan C. Leslie of the Royal Horticultural Society's Garden, Wisley, Woking, Surrey for kindly sending us regularly a copy of their monthly weather report.

Mike Towns published a survey of the rabbits on Bookham Common in 1972 (*L.N.* **51**), an account of rabbit infections with *Coccidea* in 1973 (*L.N.* **52**) and he also wrote a paper with A. E. Le Gros on the invertebrates of bracken areas (*L.N.* **52**). He then became Conservation Warden for Milton Keynes Development Corporation, and was subsequently appointed Warden of the Northam Burrows County Park, Devon. He has written two books, *Along the Shore. Discovering North Devon's Coastline* and *The Family Naturalist's Companion.*

R. C. Stern has been made Adviser for Conservation for the South-east Region. Bookham Common comes within his area. An 'Open Day' was held on 8 September.

Vegetation: Buckthorns (K. Page†)

Recent tree and shrub clearance on the Common has revealed specimens of purging buckthorn *Rhamnus catharticus,* five on Bayfield Plain 732, 763 (division Q) and two on Central Plain by Common Road 852, 861 (division S) and one alder buckthorn *Frangula alnus* on Bayfield Plain 732 (Q), i.e. in two new localities and for *F. alnus* one division (Q) not included in Radcliffe and Page (1981). Both genera are relatively scarce on the Common, which is not surprising as *Rhamnus* is typical of an alkaline habitat whereas *Frangula* grows mainly on peatier, acid soils. Growing together on moderately acid, London Clay appears somewhat atypical.

Furthermore, documentary evidence suggests that these plants are possibly a recent addition to the Common. J. E. Lousley's *Flora of Surrey* (1976) did not record either plant there. In *The Flora of Bookham Common* Jones (1954) did not find *Rhamnus* and admitted that *Frangula* was doubtfully seen. Likewise C. E. Salmon's *Flora of Surrey* (1931) did not observe them in this area.

Sometimes the two genera are confounded: the major botanical differences are set out below.

Rhamnus catharticus	*Frangula alnus*
Plants with thorns	Plants without thorns
Buds with scales	Buds without scales
Margins of leaves serrated	Margins of leaves entire
Colour of underside of peeled bark: orange	Colour of underside of peeled bark: yellow

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The Progress of the Knopper Gall on the Oaks (Ella M. Hillman*)

The knopper gall *Andricus quercuscalicis* was first seen on the Common in 1977 (Radcliffe 1981). In 1980 on a random walk through northern plains and woods no unaffected acorns were found except for two empty acorn cups near Five Halls 449, but some blackened galled acorns were found beneath two old oaks near Isle of Wight Pond.

The failure of the acorn crop was, however, probably attributable to factors other than the presence of the gall. In September 1982 the following note was made on 14 oaks in South-east Wood:

two old oaks — both had knopper galls
four medium oaks — one had knopper galls
eight young oaks had no acorns at all,

and in October acorns on West path were fairly plentiful and unaffected.

It would be desirable to find a method within the limits of the Bookham Common survey which would enable comparisons to be made from one year to another and between different areas on the Common. The following method was tried as an experiment along a strip running north from the railway station, mainly along the western edge of the main woods. At random intervals of a few paces along the route 'oak stations' were chosen, these were the ground under a single oak or a group of two to four oaks overlapping in the canopy, and there the state of the fallen acorn crop was estimated. Twenty-eight stations were recorded and in all of them knopper galls were present. In the majority the unaffected acorns (U) outnumbered the knopper galls (K), the ratio of their numbers U:K, varying from about 3:1 to 10:1, and this range will be regarded as the norm for this area on 13 October 1985. Exceptions to this are listed below.

1st area. Western edge of South-east Wood. Ten stations, 6 had U:K much greater than norm (100 or more:1).
2nd area. Eastern Plain. One station, numbers about equal.
3rd area. Within woods east of Common Road, north of Castell Research Hut 571, 7 stations, three had more K than U.
4th area. Western edge of woods to east of Common Road, north of Castell Research Hut 571, 10 stations, one had U greatly in excess of K, two had no acorns but several empty ungalled cups. A party of jays *Garrulus glandarius* was vociferous by the last two trees, which may account for the dearth of sound acorns.

The optimum conditions for observations did not present themselves until 1985. A sunny day in October seems the best time, otherwise the fallen galled acorns are scarcely distinguishable from small lumps of mud among the leaf litter, and if left until later, the falling leaves will have covered them and mammals and birds will have taken their toll of the sound acorns. To sample the whole of the Survey area would need several workers simultaneously recording on a favourable day, or one observer working on several such days over a short period.

It is now well known that the wasps emerging from these galls reproduce asexually and lay their eggs in the catkins of the Turkey oak *Quercus cerris*. The insects emerging from the resulting small galls mate and their eggs are laid in the female flower heads of the English oak *Q. robur* or durmast oak *Q. petraea*. These cause the formation of knopper galls (Shirley 1980). Hence it seems that Turkey oaks must be present for the survival of this gall-wasp population, and these trees are to be found in nearly all the area divisions A-T on the Common.

A good acorn crop was produced in 1985 and it is unlikely that the gall threatens the regeneration of the oakwoods. It is not known how its interference with the food supply of small animals affects their population numbers.

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Bryophytes (O. B. J. French†)

First of all, a warm welcome to Gundula Azeez, a student at Sutton High School, who has joined the dwindling ranks of the bryophyte team and who promises to become a great asset.

Unfortunately, during 1985 I was forced to miss far too many Survey meetings with the result that the following list of one previously unrecorded species and sixteen new Area records (only one hepatic among these) is probably a good deal shorter than it would otherwise have been.

Hepaticae		
Metzeria furcata	Q	
Musci		
Campylopus pyriformis	H	
C. paradoxus	F	
Fissidens bryoides	Q	
Barbula unguiculata	E	
B. cylindrica	MS	(one record from gravelly soil; one from mortar in railway tunnel parapet).
Aulacomnium androgynum	Q	
Drepanocladus aduncus	N	
Calliergon cuspidatum	M	
Isothecium myosuroides	MS	
Homalothecium sericeum		
Pseudoscleropodium purum	C	
Rhynchostegium confertum	F	
Eurhynchium striatum	D	
Hypnum cupressiforme var resupinatum	B	
H. mammilatum	BT	
H. jutlandicum	Q	

Barbula cylindrica does not appear to have been recorded from the Common previously. Ella Hillman made an interesting find when she collected *Drepanocladus aduncus* from Area N where it was originally discovered by C. P. Castell many years ago, but where it has not been found since 1967; since Castell's time this species has only been seen in Area D where he also recorded it, but his third locality, Area S, has so far not yielded a later record.

I am extremely grateful to Ted Wallace for his invaluable help in checking the specific determinations of difficult material.

Until recently no separate herbarium of Bookham bryophytes existed but one is now being compiled of voucher material in support of the published systematic lists. Ron Boniface (who sadly died on Christmas Eve*), Jack Gardiner and Rod Stern (*int. al.*) have generously contributed packets of rare plants which they gathered at Bookham, but, unfortunately, there are a number of species recorded since 1967 which are unrepresented and which may never be found again on the Common. Much work remains to be done collecting several common plants which are still absent from the herbarium and, in particular, gathering fertile material of species which occur frequently and which are known to 'fruit' freely at Bookham of which only barren specimens are now present in the herbarium. It is hoped that eventually a permanent repository will be found for the herbarium where it will be easy of access for study by bryologists in the Society. It is probably wishful thinking to hope that one day the Bookham gatherings of C. P. Castell and J. H. G. Peterken between 1941 and 1967 (which include a number of species believed to be now extinct on the Common) will be separated from the main herbarium now stored at the National Museum of Wales, where it is unaccessible to most members, and be deposited alongside the herbarium of more recent material now being prepared.

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*See Obituary on p. 200.

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Fungi (Pamela Goldsmith†)

The following species, new to Bookham Common, were found during 1985:

Merulius corium.
Psathyrella condolleana
Callypha goldbachii on *Juncus*
Hapalopilus nidularis
Ustilago succisae
Ustilago violacea on *Stellaria graminea*
Entomophthora musca
(checked by Dr. D. Reid of Kew)
Callorina fusaroides (asexual stage)
Dasyscyphus pulverulintus
Sclerotinia curreyana
Botrytis cinerea
Orbilia xanthostigma
Callorina fusaroides
Uromyces ficeriae rust on celandine
Trimmatostroma betulina
Anthracobia melaloma
Diatrype bullata
Colpoma quercina
Hyascypha hyalina on *Quercus*
Microscypha grisella hidden in hairs on fern
Pezizella amanti on *Salix* catkins
Leptotrochila cerastiorum
Tapesia fusca
Nitschkia collapsa on old *Eutypella prunastri*
Phoma complanata on umbellifer stem
Trichia contorta
Neptera melatephra
Ungularia millepunctata
Dematioscypha dematiicola
Hymenoscyphus citrinus on *Urtica*
Mollisia revincta
Platychora ulmi on elm

Ascomycetes (checked by Dr. B. Spooner) on a fungus foray on Bookham Common.

Aquatic Invertebrates (J. W. Coles*)

In early September 1985 samples were collected from the Isle of Wight, Western and Eastern Hollow, and Lower Eastern Ponds.

Protozoa, Mastigophora. In the Eastern Hollow Pond were vast numbers of the dinoflagellate (Dinophyceae) *Ceratium*. The water was quite green with them. It was strange that they were not present in the other ponds mentioned above.

Annelida, Oligochaeta. *Peloscolex velutinus* (Grube) was found in the Isle of Wight Pond (det. R. W. Sims, Annelida Section B.M.(N.H.)).

Rotifera, which were quite abundant, and crustaceans, all belonged to species which had been identified on previous occasions. No free-living nematodes were found.

Odonata (G. Beven)

Ruth Day, who joined the L.N.H.S. January 1985, has been carrying out a population study of the more common species of Odonata at Bookham Common since the beginning of July 1985. During the summer she worked on the damselfly imagines, using a mark/recapture method. She is currently netting larvae, identifying their species, counting and measuring them, using the Castell Research Hut as a site laboratory. It is hoped that a report will be published in *The London Naturalist* for 1987.

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Coleoptera (G. Beven)

The glow-worm

Observations of glow-worms *Lampyris noctiluca* from 1938 to 1981 have been reported by Beven (1983). Since then several more have been seen. In 1984 – one on 30 June at 22.15 hrs was on the edge of Isle of Wight Road 8158 and on 1 July one was at 22.00 hrs on the edge of Isle of Wight Path (South) 858 (L.M.), one by Isle of Wight Road 842 on 4 July, one on 10 July by Little Bookham Road 876 and on 11 July one by a path on Isle of Wight Plain 493 (D.A.B., P.C.B.). In 1985 – on 6 May one was at 00.30 hrs in Manor Cottage Lane 574, on 11 October at 22.30 hrs by Manor Cottage 574 and on 18 October one at 21.15 hrs by Handley's Cottage 575 (I.S.). Adults are usually seen from April until July, so it seems likely that those seen in October were larvae which are also strongly luminescent and Easton (1947) found larvae on the Common in November, December and February under a log or in hay refuse where they, presumably, largely spend the winter. Larvae take three years to reach the adult stage.

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BEVEN, G. 1983. Coleoptera. The glow-worm. *Lond. Nat.* **62:** 91.

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Macrolepidoptera (D. A. Boyd*)

Although it was not a fine summer, 19 species of butterflies were seen. The most noteworthy was a marbled white *Melanargia galathea* on Bayfield Plain 842 on 20 July (D.A.B.), not previously recorded on the Common (Wheeler 1955). Also seen were white admirals *Limenitis camilla,* a male purple emperor *Apatura iris* in Hill House Wood 279 on 14 July and a small pearl-bordered fritillary *Clossiana selene* near Lower Eastern Pond 593 on 6 July (D.A.B., P.C.B.). Purple hairstreaks *Quercusia quercus* were in Hill House Wood, on Western 459 and Bayfield 845 Plains, while Essex skippers *Thymelicus lineola* and small skippers *T. sylvestris* were also seen (D.A.B., P.C.B.).

One red underwing moth *Catocala nupta* was flying around the canopy of an apple-tree on Bayfield Plain 736 on 26 October, and four larvae of the fox moth *Macrothylacia rubi* were on a small sallow bush on Bayfield Plain in late August (D.A.B., P.C.B.).

Reference

WHEELER, A. S. 1955. A preliminary list of the Macro Lepidoptera of Bookham Common. *Lond. Nat.* **34:** 28-36.

Microlepidoptera (G. Beven)

The following species, not included in the list from Bookham Common by Le Gros (1977), were found by Colin W. Plant on 8 September 1985 in sq. 54, 57, 86 and 88:

Nepticulidae (leaf miners)
Ectodemia argentipedella (Zeller) on birch
Stigmella plagicolella (Stainton) on blackthorn
Stigmella ruficapitella (Haworth) on oak
Stigmella atricapitella (Haworth) on oak
Stigmella salicis (Stainton) on *Salix* sp.
Stigmella viscerella (Stainton) on elm
Stigmella hybnerella (Hübner) on hawthorn
Stigmella oxyacanthella (Stainton) on hawthorn
Stigmella crataegella (Klimisch) on hawthorn

Gracillariidae
Parornix anglicella (Stainton) on hawthorn

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Phyllonorycter quercifoliella (Zeller) on oak
Phyllonorycter harrisella (Linnaeus) on oak
Phyllonorycter corylifoliella (Hübner) on hawthorn
Phyllonorycter ulmifoliella (Hübner) on birch
Phyllonorycter oxyacanthae (Frey) on hawthorn

Tortricidae
Archips podana (Scop.) at light
Olethreutes lacunana (D.&S.) at light

Pyralidae
Agriphila geniculea (Haworth)

Reference

LE GROS, A. E. 1977. A working list of the Microlepidoptera of Bookham Common. *Lond. Nat.* **56:** 77-81.

Fish (G. Beven)

In the Isle of Wight Pond a common carp *Cyprinus carpio* was caught by an angler and returned to the pond on 23 July. It weighed 2494 grammes (5½ lbs) (D.A.B.).

Amphibia (G. Beven)

On 29 January a juvenile toad *Bufo bufo* was found hibernating 2.5 cm (1 in.) below soil surface beside an old bottle in the Isle of Wight 571 (I.S.). By 10 March two active toads were seen in Central Wood (D.A.B.) and on 25 March at 22.10 hrs 72 toads were on Common Road 572, 576 and 579 (two pairs in amplexus), on their way to the ponds (I.S.). By 31 March many were seen in and around the Isle of Wight, Western and Eastern Hollow, and Lower Eastern Ponds but on 6 April very few were observed there (D.A.B.). Spawn of the common frog *Rana temporaria* was present in Crater Pond 823 on 30 March and in Western Hollow Pond on 31 March (D.A.B.).

Birds (G. Beven)

Population Studies in Oakwood

Unfortunately, owing to lack of observers, it was not possible to repeat the breeding-season census in the 16-hectare sample of dense pedunculate oakwood in 1985. However, it transpired that Andrew Merritt had done some extra counts during 1984, although his results were not received in time for the 1984 Progress Report. Thus he and Leonard Manns made 17 visits between April and July 1984. As a result the figures for 1984 have been adjusted. In 1981, 1982, 1983 and 1984 the wren *Troglodytes troglodytes* territories were 23, 33, 21 and 27, of blackbird *Turdus merula* 20, 14, 13 and 12, and of the robin *Erithacus rubecula* 28, 28, 26 and 26. Thus the wren population increased again and blackbirds have decreased further but the robins have remained the same. The numbers of great tits *Parus major* has increased slightly, the figures for the same years being 16, 11, 11 and 13, and the number of blue tits *P. coeruleus* has also increased slightly, the corresponding figures being 16, 19, 21 and 23.

Population Studies in Scrub and Grassland

The breeding season census was repeated in 39 hectares of scrub and grassland in 1985 by D. A. Boyd and Penny C. Boyd. Eight counts were made between April and June. The numbers of territories for 1982, 1983, 1984 and 1985 respectively were, for wrens 16, 18, 32 and 24, for robins 20, 20, 34 and 20, and for blackbirds 19, 12, 22 and 16. The decrease in the numbers of territories of some resident species may well have been due to a high mortality rate during the severe cold weather the previous winter. It is interesting to note that the number of territories of migrant warblers had not decreased, the numbers for the same years being, blackcaps *Sylvia atricapilla* 4, 4, 2 and 6, garden warblers *S. borin* 6, 7, 6 and 6, whitethroat *S. communis* 14, 11, 12 and 14, lesser whitethroat *S. curruca* 3, 1, 2 and 3, willow warbler *Phylloscopus trochilus* 22, 13, 25 and 26, and chiffchaff *P. collybita* 4, 6, 3 and 6. The number of great tits has remained much the same, the figures for the same years being 11, 10, 13 and 11, whereas the blue tits have increased, the corresponding figures being 10, 10, 19 and 22.

Other Notes on the Birds during 1985

During the severe cold weather eight golden plover *Pluvialis apricaria* flew west with a flock of 20 lapwings *Vanellus vanellus* at 11.55 hrs on 5 January (D.A.B., P.C.B.). In January about 250 lapwings were seen flying between west and south in eight flocks on the 5th and 440 flying west and north-west on the 6th, and in February, 50 were flying south on the 9th and 12 were flying south on the 10th. On 5 January seven snipe *Gallinago gallinago* flew west over Central Plain, on the 6th three flew low over scrub 732, five low over Bank's Common and one over Isle of Wight Plain 494, while on 16 February one was flushed from ditch 899 (D.A.B., P.C.B.). A green sandpiper *Tringa ochropus* was flushed from Western Pond 732 on 29 April (D.A.B., P.C.B.). About 1000 woodpigeons *Columba palumbus* were feeding on acorns during December (D.A.B., P.C.B.). It is interesting to note that in 1985 there were two territories of grasshopper warbler *Locustella naevia* in the Western Pond area of the plains sq. 49, 73 on 9 and 17 May. These warblers were regular summer visitors for most years since 1911 but no birds have been seen there since 1976 until this year (D.A.B., P.C.B.). There were three singing nightingales *Luscinia megarhynchos* during May, one each on Bayfield, Central and Western 452 Plains (D.A.B., I.S.). During the cold spell in January-February fieldfares *Turdus pilaris* were present on the plains, varying from 100 to 400, decreasing to ten in mid-February, feeding on blackthorn berries. Also on the plains in the same months, redwings *T. iliacus* varied from 100 to 250 decreasing to ten in early February. Fieldfares were present again at the end of the year with a maximum of 40 on 1 December, and between 40 and 200 redwings were present from 13 October until the end of the year (D.A.B., P.C.B.). A party of 3-4 crossbills *Loxia curvirostra* flew east over South-east Pond 917 on 3 August (D.A.B., P.C.B.).

Anatidae

Mute swans *Cygnus olor* occasionally visited the Isle of Wight Pond during the winter but it was not until 1971 that a pair nested among willows on the eastern side of the Isle of Wight Pond and reared three cygnets (G.B., N.D., E.M.H.). During the winter of 1972-3 the Isle of Wight Pond was enlarged and deepened and Freeman's Island was created in the centre. Although mute swans were occasionally seen flying over the Common, it was not until 1975 that a pair built a nest on Freeman's Island and produced three young, the family not leaving the Pond until 27 October 1975 (G.B., N.D., E.M.H.). However in 1976 the water plants completely failed to appear, except for small patches of *Myriophyllum*. Nevertheless mute swans nested on Freeman's Island again and hatched four cygnets. But they went for long walks in June, presumably because of the scarcity of waterweed, and one cygnet died. The rest of the family finally walked away from the pond and did not return. The cygnets were small and weak, could not fly and kept sitting. They were presumably starving (N.D.). Cygnets eat aquatic vegetation torn off by parents, probably also insects and aquatic invertebrates (Cramp and Simmons 1977). In subsequent years mute swans appeared on the ponds several times but a nest was not built until 1983 and then on Eastern Hollow Pond where four cygnets were hatched (D.A.B., E.M.H., A.M., I.S.). In the summer of 1977 Eastern Hollow Pond had been reconstituted as a pond and became filled with water by autumn 1977, but presumably took until 1983 before there was sufficient aquatic vegetation for the nesting of the mute swans. It is noteworthy that the Isle of Wight Pond was visited by the swans and their four cygnets on 27 December 1983 (I.S.) and by a pair and one cygnet on 5 March 1985 (A.P.).

In April 1975 the pair of mute swans was seen in display with necks intertwined while the male raised his wings considerably more than the female, and he had more marked erection of his neck feathers. The birds were quite vocal. The adults were also seen to swim side by side with necks upright, and then move together to dip head well into water, then up again, then they each preened their back feathers, followed by repeated dipping and preening more or less alternately, keeping exact time with one another while getting more and more excited and quickening up. The male mounted the female, his bill gripping the feathers at the back of her neck. Then they separated and both did a lot of preening. Finally facing one another they both stood upright with necks straight up, treading water, keeping this position for a minute or so (G.B.).

Three domestic geese (grey-lag) *Anser anser* were on the Isle of Wight Pond on 10 April 1949. They swam about together and all repeatedly dipped their heads in water. While doing this, two began pecking each other's rump several times. Then the white male mounted the female which was swimming in the water and coition took place, meanwhile the male was pecking and biting the top of the female's head. On 9 November 1967 E. F. Youngman (keeper) put two domestic geese in his garden 571 but the same night both had their heads bitten off by a fox. On 19 January 1985 25 grey geese (?species) were flying E.S.E. over the northern side of the Common (D.A.B., P.C.B.).

From September 1974 parties of between five and 50 Canada geese *Branta canadensis* were quite often seen flying over the Common during the winter months, sometimes coming down to the Isle of Wight Pond where 15 were present on 17 March 1985 (I.S.); a pair was occasionally feeding on grassy fields, e.g. sq. 91, and on 8 September 1974 24 were feeding in a field of barley sq. 24 (G.B., N.D., G.W.). On 27 April 1975, after a dispute between two pairs of Canada geese and a pair of mute swans, the geese left and the swans remained (P.C.) and ultimately nested in 1975 and 1976. Nesting by Canada geese did, however, occur on the Isle of Wight Pond (Freeman's Island) in 1977, possibly in 1978, and certainly in 1980 producing one gosling. Five goslings were hatched on the Island in 1981 (but were presumably all lost), four in 1983, six in 1984 and five goslings in 1985 (D.A.B., P.C.B., N.D., I.G., E.M.H., L.M., A.M., A.P., I.S., G.W.). The aquatic waterweed is still scarce in the Isle of Wight Pond, but Canada geese feed mainly by grazing plants on land, only occasionally taking plants from water (Cramp and Simmons 1977).

One brent goose *B. bernicla* was seen by S. K. Reeves flying S.E. over Eastern Plain at 11.00 hrs on 22 February 1970.

The mandarin *Aix galericulata* first appeared on Bookham Common in January 1969 on the Isle of Wight-Upper Eastern chain of Ponds. 'In recent years there has been a marked expansion of range of the Windsor Park-Virginia Water population of mandarins into other parts of Surrey... By 1969...between 100-120 mandarins had colonised parts of the middle reaches of the River Mole...'. The total in Britain is about 1,000 birds (Lever 1977). However Davies (1985) writes that he believes the British population is around 1,000 pairs and that by 1981 there were more wild mandarins in the south of England than in the whole of China, although Japan now has the largest population with perhaps 5,000 pairs. On Bookham Common they nested and produced young in 1969, 1977, 1984 and 1985 (D.A.B., P.C.B., C.R.A.C., N.D., L.M., M.P.). They held territories in Eastern Wood from 1969 to 1972, in 1975, '77, '79 and '84 (G.B., L.M.), probably also in Central Wood in 1972, in Kelsey's Wood, Stent's Wood and Kelsey's Pond area in 1973, '75, '77 and '78, and in Sheepbell Wood-Mark Oak Ponds area in 1977 (N.D., D.M-W., A.S.T.).

Mandarins often arrive as early as November, usually in small parties of between two and 30 (G.B., D.A.B., P.C.B., R.G., C.H., A.S.T.). Unless they have produced young they do not seem to stay in the wood after about June. They are usually seen on the ponds or flying about in or above the wood, but often are perched in trees, sometimes in willows growing out of the ponds, or perhaps 7-20 metres (20-60 ft) up oaks as far as 25 metres (75 ft) from the ponds. They may frequent very small ponds surrounded by trees, e.g. Sheepbell Pond (G.B., N.D.), and may often swim under cover and hide in the overgrown parts of the pond (G.B.), and may be seen walking on paths or searching a ditch or the leaf litter under the oaks in the wood 160-400 metres (480-1200 ft) from a pond (G.B., M.M.T., A.S.T.). On 12 June 1977 G. Whitehead remarked that a drake would come to be fed on 'scraps', on the Isle of Wight Pond every morning. The birds when flying call frequently, a repeated low trumpeting 'honk' and a high pitched whistle. Another flight call is a very striking, short and abrupt 'eck' which is not unlike the 'kewk' of a coot *Fulica atra* (Cramp and Simmons 1977).

Mallard *Anas platyrhynchos* are numerous and have been present, at least, since 1943 (Carrington *et al.* 1944). They breed commonly, but special investigation has not been made. They may be found on the ponds throughout the year. Between November and January on the Isle of Wight Pond as many as 29 mallard, mostly in pairs, may be seen chasing one another and in display with much loud whistling (G.B., E.W.G.). In 1949, '59, '66-'75, '77, '78, '83 and '84 a female was seen with young on the Isle of Wight Pond, probably with two broods in five of these years, also two separate families in six and three separate families in two further years. On Lower Eastern Pond a female and young were seen in 1968-72, '74, '77-'79 and '84, two separate families on two occasions and two broods on three occasions. Family parties were seen on Upper Eastern Pond in 1966-68, '77-'81 and '85, and on Eastern Hollow Pond in '78 and '84. A duck may be seen with 2-17 young, not necessarily all from the same brood. Nests have seldom been found, but a duck flew off a nest with seven eggs near Lower Eastern Pond on 28 March 1977 (N.D.) and by the Isle of Wight Pond broken eggs and nesting material were found at the foot of a large oak from a nest in a hollow ten metres (30 ft) above on 22 April 1978 (N.D.). On 8 July 1973 on the Isle of Wight Pond a large dog swam after a duck across the pond round the island and back, the duck swimming, keeping only a little ahead and then fluttering on two or three metres and swimming again to the other side of the pond, successfully leading the dog right away from her five well grown young. Other ducks watched anxiously, keeping close together but not flying (G.B.).

A teal *Anas crecca* was seen on the Isle of Wight Pond on 30 January 1949 (P.W.E.C.) and on 10 March 1968 (G.B.). In early December 1974 a pair flew over Manor Cottage 574 (I.G.) and on 11 January 1976 two flew over the keeper's cottage 571 (N.D.), while on 1 and 24 February 1977 a pair was on Upper Eastern Pond (N.D., G.W.). In 1984 on 18 March there were seven on Lower Eastern Pond and on 24 August six on Upper Eastern Pond, in 1985 four flew over the Hollow Ponds on 10 March and a male was on Upper Eastern Pond on 7 December (D.A.B., P.C.B.).

In early May 1972 a pair of gadwall *Anas strepera* was on Lower Eastern Pond (D.M-W.).

In the early morning of 30 January 1949 a female wigeon *Anas penelope* was seen on the Isle of Wight Pond (P.W.E.C.).

In 1932 a male shoveler *Anas clypeata* was shot on the Common (D.L.). A male was seen on the Isle of Wight Pond on 21 March 1976 (G.W.), one on 3 April 1981 (I.S.), and one flying west over Western Plain on 8 December 1985 (D.A.B., P.C.B.).

A pair of tufted ducks *Aythya fuligula* was seen on 25 May 1974 on the Isle of Wight Pond (A.M.) where also one or two birds were seen on 16 April 1975, in May-June 1976 and from 19 to 28 June 1977 (N.D., G.W.). From 21 April 1978 there were sometimes as many as six pairs on the Isle of Wight-Upper Eastern chain of Ponds, and on 19 July a female was seen on Eastern Hollow Pond with six small chicks in down (G.B., N.D., G.W.). Birds were also noted on 8 April 1979, on 26 April 1980 and in May-June 1981 (G.B., E.M.H., A.M., I.S.).

Strigidae

Barn owls *Tyto alba* have been seen on the Common in most years since 1942 (Carrington *et al.* 1944) until 1979 but none since (many observers). On 10 September 1944 a young bird was seen, still with some down, running along the road flapping its wings, being unable to fly (A.R.W.). In the early days of the Survey barn owls were seen hunting in daylight more commonly than in later years, as for example, in 1945 (A.R.W.), 1948-51 and 1953 (G.B., P.W.E.C.). These birds were sometimes flying quite near to people and apparently taking little notice of them. After about 1953 the owls were seen mainly in the early morning, at dusk or at night, when they were frequently heard calling near the Isle of Wight. They were occasionally found roosting, e.g. one in a small oak, still retaining some dead leaves, at the edge of Eastern Wood 6737 on 13 March 1948 (P.W.E.C.), on 14 February 1960 one was in a bracken-covered hawthorn on Bayfield Plain 7319 and another was in a tall ivy-covered holly 4267 on Western Plain (G.B., P.H., F.C.R.). Pellets were occasionally found, below roosts under trees on the edges of the plains or in a barn on Kelsey's Farm (G.B., P.W.E.C., P.H., F.C.R., A.S., E.S.). The contents were examined for vertebrates by J. Cooper (Brit. Museum (Nat. Hist.)), Enid Nelmes and G.B., and for beetles by K. C. Side. The method of converting prey items to prey units by means of a conversion factor (C.F.) follows Southern (1954) and the weights of beetles were assumed to be one gramme (Yalden 1985).

Contents of pellets of barn owl.	*Prey items*	*C.F.*	*Prey units*	*%*
Common shrew *Sorex araneus*	13	0.5	6.5	5
Pygmy shrew *Sorex minutus*	4	0.2	0.8	0.6
Water shrew *Neomys fodiens*	1	0.75	0.75	0.5
Bank vole *Clethrionomys glareolus*	8	1	8	6
Field vole *Microtus agrestis*	89	1	89	67
Wood mouse *Apodemus sylvestris*	7	1	7	5.2
Dunnock *Prunella modularis*	2	1	2	1.5
Blackbird *Turdus merula*	1	4	4	3
Song thrush *Turdus philomelas*	1	4	4	3
Thrush sp. *Turdus* sp.	2	4	8	6
Blue tit *Parus coeruleus*	1	0.5	0.5	0.4
Frog *Rana temporaria*	2	1	2	1.5
Beetles	7	0.05	0.35	0,4
Total			132.9	100.1

(Beetles – *Dorcus parallelopipedus* 2, *Geotrupes* sp. 3, *Pterostictus melanarius* 1, *Aphodius* sp. 1).

A long-eared owl *Asio otus* was calling in Great Mornshill Wood 400 metres (¼ mile) west of the Common in March and April 1944 (R.W.H.). From mid-January to 21 April 1979 a party of up to six roosted near Hundred Pound Bridge in thickets of blackthorn and hawthorn. The contents of their pellets are given in *Lond. Nat.* (1980) **59:** 64. One was watched hunting low over Bayfield and Isle of Wight Plains at dusk on 14, 28 and 29 December 1985 (D.A.B., P.C.B.).

A short-eared owl *Asio flammeus* was watched hunting over Western Plain in the morning and afternoon, skimming the ground among the bushes in the more open parts on 12 November 1950 (G.B.) and on 13 December 1953 one flew across Central Plain and over South-east Wood towards N.E. (G.B.). One was also seen on the Common on 16 September 1962 (P.J.O.), and one was flying at 70-100 metres (200-300 ft) over Central Wood towards S.S.W., mobbed by two carrion crows *Corvus corone* on 10 November 1985 (D.A.B., P.C.B.).

L. I. Carrington *et al.* (1944) described the little owl *Athene noctua* as 'fairly well distributed as a marginal species, especially near the fields adjacent to the Common on the north'. Birds were observed between Hundred Pound Bridge and Kelsey's Wood in 1943, '44, '57, '60 and '72 (G.B., R.W.H., A.R.W.). Also at the Grange, less than 800 metres (½ mile) to the north of the Common a pair produced young in 1968, '69 and '77 (G.B.). In addition birds have been seen near Bayfield Hotel in 1947 (P.W.E.C.), the Isle of Wight in 1974 (I.G.) and 1977 (N.D.), the Glade 545 in 1976 (N.D.) and Eastern Hollow in 1977 (G.B.). A few pellets were found to the north of the Common 252 (G.B., G.T.) containing one common shrew, two field voles and beetles (determined by K. C. Side) – *Geotrupes* sp., *Pterostichus melanarius* and *Harpalus rufipes*.

Tawny owls *Strix aluco* are the common owls of Bookham Common. In the 112 hectares (280 acres) of oakwood west of the Cobham Road, there appeared to be four territories in 1965, 4 in 1966, 3-4 in 1967, 5-6 in 1968, 4-5 in 1969, 5 in 1970 and 4 in 1984 (G.B., J.B., D.A.B., L.M.). However it must be admitted that the most northern parts of the woodland (Kelsey's Wood across to Sheepbell Wood) have not been well searched so that some territories may have been missed. This may explain why the territory size in the oakwood at Bookham seems to vary from 19 to 36 ha (47 to 90 acres) whereas in oakwood at Wytham near Oxford in dense ground cover on clay, the average territory size was 13.8 ha (34.5 acres) (Southern 1970). At Bookham Common on the whole of the 152 ha (380 acres) being studied, there were also in 1968 parts of at least 2-3 territories along the western edge of the Common, i.e. a total for the whole Common, of 8-9 territories in 1968, similarly 6-7 in 1969, and of 5 in both 1970 and 1984, thus varying from 16.8 to 30.4 ha (42 to 76 acres) in size. In western Europe territories in optimum habitats are 25-30 ha (Cramp 1985). Clare Harding records 3-4 tawny owl territories in the village area of Great Bookham, of about 256 ha (640 acres), i.e. an average of 56 ha (140 acres).

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Observers: G. Beven, D. A. Boyd, Penny C. Boyd, J. H. Bratton, C. R. A. Clegg, P. Crook, P. W. E. Currie, N. Davies, I. Grant, E. W. Groves, R. Griffiths, Clare Harding, P. Harland, R. W. Hayman, Ella M. Hillman, D. Longhurst, D. Macer-Wright, L. Manns, A. Merritt, P. J. Oliver, A. Piper, Miss M. Portlock, F. C. Reeves, K. C. Side, A. Stevens, E. Stevens, I. Swinney, G. Taylor, Margaret M. Taylor, A. S. Thorley, G. Whitehead, A. R. Wilton.

Mammals (G. Beven)

A hedgehog *Erinaceus europaeus* was drinking from a puddle at 21.50 hrs on Common Road on 22 July (I.S.). On 22 December a dormouse *Muscardinus avellanarius* was found hibernating at the base of a hawthorn on Central Plain 824. As its nest was broken and it had been disturbed it was decided to move it to a quieter area. So although still sleeping, it was placed in the tractor but after an hour it woke up and escaped (I.S.). A fox *Vulpes vulpes* was watched hunting a rabbit *Oryctolagus cuniculus* on Central Plain at 14.45 hrs on 18 March (I.S.). On

30 December one was seen in a field north of Bank's Common 413 carrying prey in its mouth (probably a small mammal), walking towards scrub on the edge of the field, where it swallowed the prey and entered the scrub area (D.A.B.). A weasel *Mustela nivalis* was seen on 20 April in an oak tree in Central Wood about 2.7 m (8ft) up. It may have been attracted to the nest of a nuthatch *Sitta europaea* in a hole in a branch of the tree (D.A.B.). Roe deer *Capreolus capreolus* were again observed frequently, single deer being noted on 19 occasions, two were seen six times, three on two occasions, a doe and one fawn three times and a doe and two fawns once (D.A.B., P.C.B., E.W.G., A.P., I.S.). Ian Swinney tells me he had many more sightings of roe during autumn-winter of 1985. Roe deer were first seen on the Common in 1967 and are now well established. Even by that date J. S. R. Chard (1967) stated 'dispersal of roe deer in the south (of England)... has gone faster in the last ten years than in the whole of the previous century... the controlling factor has undoubtedly been the suppression of the rabbit by myxomatosis, which has thickened the cover and increased the quantity and quality of the feed'. The first epizootic of myxomatosis reached Bookham Common in 1954, after which rabbits became very scarce for the next three years and then they gradually increased again. Subsequently, minor epizootics occurred every few years, for example, there were at least nine more between 1958 and 1979 (G.B.).

Reference

CHARD, J. S. R. 1967. Feral deer in England. *Forestry Supplement* **40:** 28-31.

Molluscs in the Isle of Wight Pond (Ruth Lee*)

The Bookham Common Survey Committee kindly gave permission to sample snails in the Isle of Wight Pond for *Sanguinicola inermis* (Plehn) infection from July to October 1985. *S. inermis* is a blood parasite of carp which is transmitted by *Lymnaea peregra* and *L. stagnalis*. This parasite was found in carp from the Isle of Wight Pond in 1980 and therefore a study was carried out to investigate the longevity of the infection. No snails were found to be infected with *S. inermis* although other non-pathogenic parasites were present.

During the course of the investigation a record of molluscs observed at each collecting site was maintained. Six species of snails were observed in the north-east corner of the Isle of Wight Pond. The dominant species at this site appeared to be *Aplecta hypnorum* (L.) which constituted approximately 70% of all snails observed. *L. peregra* (Müller) constituted 25% of observations, whilst a few *L. stagnalis* (L.), *Planorbis corneus* (L.), *P. planoribis* (L.) and *Potamopyrgus jenkinsi* (Smith) were also seen. All snails were found grazing on the underside of decomposing reeds in slightly acid water (pH 6.2-7.0). These observations are similar to those of Bensley (*Lond. Nat.* (1948) **27:** 51-55) although my sampling techniques precluded a survey of bivalve species. In contrast *L. peregra* appeared to form the dominant mollusc population in the Lower Eastern Pond and were found underneath submerged fallen branches. *A. hypnorum* were observed in fewer numbers grazing on vegetation. Some empty bleached shells of *L. palustris* (Müller) were also found. No snails were observed in deeper and less weedy north-west and south-west sites of the Isle of Wight Pond.

The snails were named using Beedham, G. E. 1972, *Identification of the British Mollusca,* Hulton Educational Pub. Ltd.

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Botanical Records for 1985

by R. M. Burton*

Summary

Major discoveries in 1985 of flowering plants within 20 miles of St Paul's Cathedral include *Draba muralis* new to Kent, *Cardamine impatiens* apparently new to Middlesex, *Populus canadensis* × *candicans* described from Middlesex, *Polygonum cuspidatum* × *sachalinense* in Herts. and *Ophrys apifera* in an urban locality. A map is presented of the distribution of *Conyza sumatrensis*, an alien which is proving to be localy frequent in east London.

Introduction

This paper continues the series begun by J. E. Lousley, over forty years ago, as a place for publishing the more remarkable botanical discoveries made each year in the recording area of the London Natural History Society, a circle of radius 20 miles centred on St Paul's Cathedral. From the first, the records were divided according to the system of vice-counties devised by Watson (1852) and still used as the geographical basis for its network of local recorders by the Botanical Society of the British Isles. Starting with the records for 1968, the text of these papers has also included tetrad references for each plant locality mentioned; these subdivide the area into squares of two by two kilometres. A note explaining why this practice is being abandoned may be thought desirable.

The usefulness of tetrad references is most obvious in the case of species which are neither so common that they can be found almost everywhere, nor so rare that it is practical to list in detail all the places where they can be found. By dividing an area up into smaller units and noting the presence of a species in each unit where it can be found in the form of a dot on a map of the area, it is possible to illustrate graphically the distribution of the species within the area. An example of such a map is given below. However, the species which usually get mentioned in these compilations of botanical records are too rare for such a map to be an adequate or economical way of describing their very limited distribution. I will continue to state in the text where the species mentioned were found, unless there is a specific reason for not doing so such as the need for confidentiality. The omission of published tetrad references must not be read as a sign that precise geographical data on our plants are no longer called for. On the contrary, it should be made clear that for the purpose of maintaining a permanent record of the plants of the London area, as I try to do, a tetrad reference is too imprecise for all the less common ones, and what is needed is a six-figure grid reference, or failing that a local sketch map pinpointing the special features of a site.

Last year (Burton 1985) I mentioned the occurrence of *Conyza sumatrensis*, a larger relative of the Canadian fleabane, in a number of places in east London where it had been found by B. Wurzell, and on Rainham Marsh in South Essex where it had been seen by R. B. Hastings. In 1985 several more localities were found by Mr Wurzell, mostly in east London, but also further north on the Parkland Walk near Finsbury Park, west near County Hall and south in Peckham Rye Park. The last two are still the only plants from v.c. 17 known to me. All these occurrences and others mentioned in this and last year's texts are shown on the map with this paper (Fig. 1). Crosses on the map indicate the presence of isolated plants (not more than two in the same place) of the species in a tetrad; the dots indicate the existence in a tetrad of at least one more substantial population.

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*Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent DA4 0JJ.

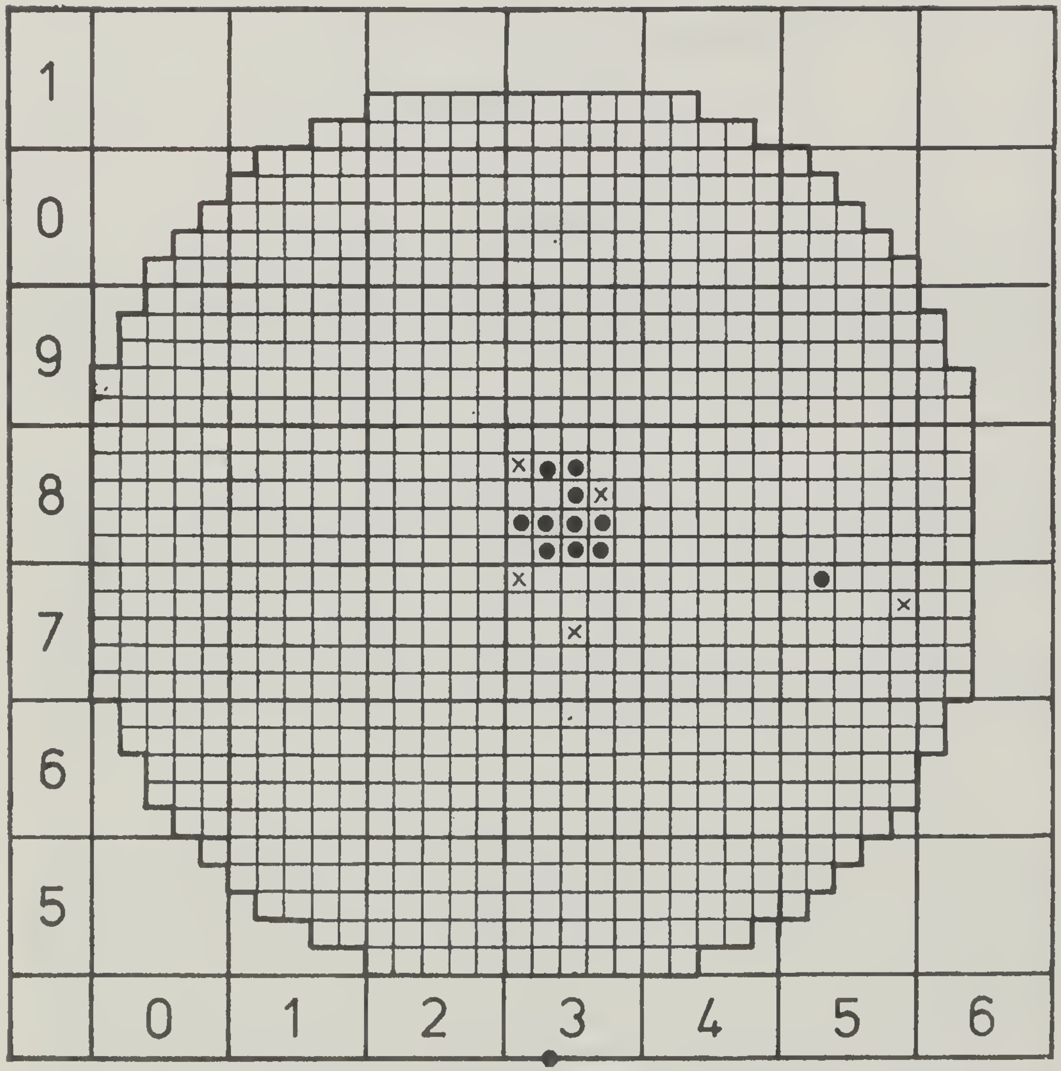

FIG. 1. Recorded distribution of *Conyza sumatrensis* (Retz.) E. Walker in the London area.

Records

V.C. 16, West Kent

In the section of this paper dealing with each vice-county, separate paragraphs contain records made on either side of the boundary of Greater London. As often, the best records from the Kent part of our area generally include discoveries by J. R. Palmer, who in 1985 found yellow figwort *Scrophularia vernalis* on Chislehurst Common and American speedwell *Veronica peregrina* as an established weed at Welling. Mrs J. Weightman found the sensitive fern *Onoclea sensibilis* in two spots by the stream in Pett's Wood. I was pleased to see a good quantity of sheepsbit *Jasione montana* on the railway bank in Bromley where I had thought it destroyed (Burton 1983: 109), so it is no longer to be regarded as extinct in Greater London. With a party of members of the Wild Flower Society, I was able to gain access to ground near Tripcock Ness in Thamesmead, visited the year before in a different season (Burton 1985: 115). In July we found three groups of plants of seaside thistle *Carduus tenuiflorus* at the western limit of its native range near the tidal Thames, white mullein *Verbascum lychnitis* and other good plants. I collected two hawkweeds, *Hieracium vulgatum* which in spite of its name is rare in south England and *H. diaphanum*. Later in the day the party found a group of fiddle dock *Rumex pulcher* in the sward near

Lesnes Abbey and soft clover *Trifolium striatum* atop the bank by Crossness Sewage Works.

Beyond the Greater London boundary in Kent, quite the best botanical discovery of the year was G. D. Kitchener's wall whitlow-grass *Draba muralis*, completely new to Kent, of which there were two groups of plants on a wall near Riverhead at the very edge of our area. Mr Kitchener also found one plant of *Trifolium resupinatum* in a lucerne field near Dean Bottom, one plant of *Conyza sumatrensis* on a tip at Swanscombe, with Mr Palmer, and several dozen plants of pheasant's-eye *Adonis annua* in a chalky fallow field at Fawkham. This field had a very good selection of the more specialised weeds of the Chalk, even including ground-pine *Ajuga chamaepitys* found there by Mr and Mrs R. G. White. My own best offerings are two plants of bee orchid *Ophrys apifera* on a road embankment at Swanley thrown up only four years before and one of Borrer's saltmarsh grass *Puccinellia fasciculata* by the main road south of Eynsford among the many *P. distans* which Mr Kitchener's researches have shown to be frequent in such situations.

V.C. 17, Surrey

Most of the interesting discoveries in the Surrey part of our area in 1985 were from London boroughs. None can be more remarkable than the colony of bee orchids *Ophrys apifera* found by M. Rigby on former railway land described as being near Brixton or near Herne Hill according to the point of view of the describer. This discovery, reported in the *London Standard* on August 19 and *The Times* two days later, raised thorny conservation problems, the land having already been bought by a potential developer with reasonable expectation of planning permission for housing. Mr Rigby also found there an eyebright *Euphrasia* sp., and a London Wildlife Trust report on the site mentions musk thistle *Carduus nutans* among the other plants, and a good range of lower plants and birds. Mr Rigby's other good find is the tasteless water-pepper *Polygonum mite* on the Thames bank near Richmond. The Trust's publication *Wild London* included a mention in No. 17 of the discovery of yellow vetchling *Lathyrus aphaca* by B. Mist in Battersea Park. Also well into south London J. E. Harvey found seedlings of *Wisteria sinensis,* mulberry *Morus nigra* and common lime *Tilia europaea*, and J. Dews again made many good finds in unlikely places among the streets of Southwark, many of them indentified with the help of the staff of the British Museum (Natural History). By a recreation ground at Peckham he collected Californian brome *Bromus carinatus* and on waste near the Old Kent Road he found many plants unusual in such surroundings, including fern grass *Catapodium rigidum*, least toadflax *Chaenorrhinum minus*, caper spurge *Euphorbia lathyrus*, *Jasminum officinale*, wild catmint *Nepeta cataria* and a massive colony of Russian vine *Polygonum baldschuanicum*.

Plants found within the Royal Botanic Gardens at Kew deserve a paragraph to themselves. Mostly they are from the neighbourhood of a new range of glasshouses, to be known as the Ten Climates House, around which soil banks were built up and subsequently grassed. The soil used seems partly to have come from other parts of the Gardens and to have contained seeds of plants grown there, but bird-seed and possibly the houses previously on the same site also appear to have contributed plants. I went there in late September, when what had been the best ground was already grassy, and I also have records of plants seen there by A. L. Grenfell, R. B. Hastings, J. B. Latham, Miss H. K. Pallan and T. D. Walker. The composite list includes *Amaranthus hybridus*, *A. lividus*, *A. retroflexus*, swine's succory *Arnoseris minima* which has long been extinct in Surrey as a genuinely wild plant, *Blumenbachia ?hieronymi*, an annual plant of the American family Loasaceae, which neither Mr Grenfell nor I cared to collect for more certain identification, nor even to handle, knowing that many plants in this family sting more fiercely than any nettle, one *Chaenorrhinum minus*, many *Chenopodium giganteum*, one *C. vulvaria* which had fortunately lost its odour by the time that Mr Latham's small voucher specimen reached me, numerous thorn-apple *Datura stramonium*, barnyard grass *Echinochloa crus-galli*, goose-grass *Eleusine indica*, hairy rocket *Erucastrum gallicum* which Mr Latham also found elsewhere in the Gardens, one very large shoo-fly plant *Nicandra physalodes*, witch-grass *Panicum capillare*, the two bristle-grasses *Setaria italica* and *S. verticillata* and a single *Solanum capsicoides*. Elsewhere in the Gardens, Mr Hastings found *Rumex pulcher* as a relict native which usually escapes notice by being mown, and on disturbed ground the Scilly buttercup *Ranunculus muricatus* and moth mullein *Verbascum blattaria*.

Two new discoveries in the part of our area continuing to be Surrey were made at our meeting of 27 July and reported to me by J. M. Montgomery. False London rocket *Sisymbrium loeselii* was found on a mound of earth in waste ground at the edge of the golf course on Weston Green near Esher; *Bromus carinatus* was near Oxshott Station. These records considerably increase the known range of both of these increasing aliens.

V.C. 18, South Essex

Parts of Watsonian vice-counties 18 and 19 lie within the London area, but the records which reached me and are sufficiently important to include in this account are all from sites in the London boroughs of Havering and Waltham Forest. In the course of a survey for the Nature Conservancy Council, B. G. Pardon was able to examine areas of Rainham and Wennington Marshes which are not easily reached, and found large stands of procumbent meadow-grass *Puccinellia rupestris* by a drain, a dense growth of the local sedge *Carex divisa* in one place not far from Rainham and spineless hornwort *Ceratophyllum submersum* and brackish water-crowfoot *Ranunculus baudotii* in small quantities in various drains. He found *Rumex maritimus* on Wennington Marshes, mostly at the edge of drains. From an area of old gravel-settling ponds near Berwick Pond, D. W. Smith sent me for identification a specimen of the alien variety of sickle medick *Medicago falcata* var. *tenuifoliata*. Brian Wurzell extended our knowledge of the hybridization potential of docks by discovering new to science the cross between *Rumex conglomeratus* and *R. cristatus*, on Walthamstow Marshes. In the same area he was also able to point out *R. crispus* × *R. cristatus*, *R. cristatus* × *R. obtusifolius* and *R. hydrolaphathum* x *R. obtusifolius*, the latter first found there by him in 1984 and a new hybrid for the county and the London area. Mr Wurzell's remarkable eye for a hybrid will be mentioned again in two different parts of this text.

V.C. 20, Herts

A. Vaughan, whose name was previously mentioned in this journal as a contributor of botanical records for 1958 (Lousley 1959), sent me a long and excellently detailed list of 1985 plant records, mostly from the Barnet area on the fringe of vice-counties 20 and 21. The old boundary is not everywhere easy to relate to modern lines and he points out that a record of *Stratiotes aloides* which I published last year (Burton 1985: 119-120) as a Herts plant was in fact from a pond in Middlesex. Mr Vaughan gives grid references and where appropriate field numbers as cited in *Totteridge Fields, a Wildlife Report* published by the London Wildlife Trust in 1985. The best novelties are salad burnet *Poterium sanguisorba* almond willow *Salix triandra*, small flote-grass *Glyceria declinata* and the two sheep's fescues *Festuca ovina* and *F. tenuifolia* together, all from various places in the valley of the Dollis Brook. Much of this small part of v.c. 20 in the London Borough of Barnet is also described in a paper by Dr D. Griffith which I hope to see published in this issue.* In a street in East Barnet C. Herbert found a good plant of finger-grass *Digitaria sanguinalis*.

I also had a long list of records from Mrs A. M. Boucher. Most of these were of relatively common species occurring in the Lea Valley from Cheshunt northwards, where there were gaps in the tetrad maps in *Flora of the London Area* (Burton 1983) which she was able to fill. However, I certainly ought to mention here monkey-flower *Mimulus guttatus* and trailing tormentil *Potentilla anglica* from a damp meadow west of Cheshunt and the hybrid *Polygonum cuspidatum* × *P. sachalinense* on a bank by a gravel-pit, now a yachting lake, in the valley near Cheshunt. This is yet another hybrid new to science first discovered by Mr Wurzell. The two parent species are large and invasive alien knotweeds which used to be planted extensively as landscape features. It seems likely that the hybrid was introduced at Cheshunt at the same time as the two species which are both also present, but nothing is known about its history in commerce.

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*See p. 47.

A single plant of pyramidal orchid *Anacamptis pyramidalis* outside its usual range was found at Moor Park by Mr and Mrs T. D. Walker, on a verge which is not usually left uncut as it was in 1985.

V.C. 21, Middlesex

Last year's report (Burton 1985: 121) mentioned an astonishing abundance of seedlings of the hybrid poplar *Populus* × *canadensis*, found by Brian Wurzell on derelict filter beds near the River Lea at the eastern edge of the vice-county. Seedlings of this commonly planted dioecious tree are virtually unknown because the clone almost invariably used is the male 'Serotina'; their occurrence in this case was attributed to the presence of mature trees of the uncommon female clone 'Marilandica'. Mr Wurzell's continuing investigation of this site has demonstrated that though such seedlings have occurred there the abundant seedling poplars are the progeny of *P.* × *canadensis* 'Serotina' and *P. candicans*, itself a hybrid of two American balsam poplars *P. tacamahaca* and *P. trichocarpa*. Also present is a single plant in need of protection, which he considers to be a cross between *P.* × *canadensis* and *P. laurifolia*. Mr Wurzell has given new names to the two hybrids described by him in a paper distributed privately entitled 'The remarkable tree flora of the Middlesex filter beds', but as they are not validly published according to current rules of botanical nomenclature I prefer not to use them. The names are in any case only marginal to the purpose of the paper, expressed in the subtitle 'A provisional analysis of the origin, evolution and ecological significance of a new poplar and willow community in East London'. Mr Wurzell's other finds in 1985 include *Vicia cassubica* at Bow which produced a specacular mass of bright purple flowers in June but had mysteriously disappeared by the autumn; a floating carpet of several millions of the alien duckweed *Lemna minuscula* in Tottenham Crematorium; and the remarkable variety *quinquepartita* of the American bellbine *Calystegia silvatica* on Tottenham Marshes. Continuing his exploration of the East London canal system of the year before, the London Natural History Society's meeting of 5 October 1985 found a good patch of galingale *Cyperus longus* on the west side of the canal near Mile End, bird-seed alien grasses *Setaria verticillata* and *Sorghum halepense* well established near the junction at Bethnal Green, one plant of the alien subspecies *sylvestris* of the blunt-leaved dock *Rumex obtusifolius*, new to Middlesex, a little further along the Hertford Union Canal and spineless hornwort *Ceratophyllum submersum* in the water north of Old Ford Lock. Near Bethnal Green, in small circular plots apparently intended for planting shrubs on the canal bank, an *Amaranthus* was collected which E. J. Clement subsequently identified as *A. bouchonii*. It now seems likely that many plants previously recorded in the London area as *A. hybridus* are the same, but it is doubtful whether *A. bouchonii*, which differs by its indehiscent fruit and little else, can be maintained as a distinct species. Later that day Mrs E. Norman and I visited the churchyard of St George's in the East in a vain search for the alien dock *Rumex triangulivalvis* in its last known British locality, and found instead abundant *Conyza sumatrensis* and deadly nightshade *Atropa belladonna*, and on a shady tomb one plant of the hard shield fern *Polystichum setiferum*, which is not known as a genuinely wild plant in Middlesex. In a different part of the canal system, R. Tabor found alexanders *Smyrnium olusatrum* near King's Cross. The same species was reported growing mysteriously on the lawn of a housing estate in Devonshire Road, W4 by J. B. Latham. Mr Latham's many other records include a seedling of *Kerria japonica* in Holland Park. Another churchyard with *Atropa* is All Saints, Fulham, reported by Miss M. Dinkel. Even nearer the centre of London, D. McClintock added to the flora of the grounds of Buckingham Palace water chickweed *Myosoton aquaticum* as a weed in the head gardener's kitchen garden, bur chervil *Anthriscus caucalis* near the lake and an unusual wild rose *Rosa afzeliana* determined by the Rev. G. G. Graham. Plants found in the City by J. E. Harvey included seedlings of Italian alder *Alnus cordata* and a hop *Humulus lupulus*. This is my first opportunity to publish the recently identified *Agrostis scabra* which I collected on a long-disused platform of the since demolished Broad Street station in 1979.

Further out but still in Greater London, L. R. Williams, whose paper on the Fryent Country Park hay meadows appears elsewhere in these pages, made the remarkable discovery in the same area of good populations of the narrow-leaved bitter-cress *Cardamine impatiens*, associated with ancient hedges; this is the first properly localised record of this rare species from the vice-county. Another good find of his in the year before was the bristly poppy *Papaver hybridum* on disturbed ground by Fryent Way; this is one of the cornfield weeds of chalky soils referred to above under v.c. 16, and is likely to be impermanent in Middlesex. Mr Williams also saw the single pyramidal orchid *Anacamptis pyramidalis* found by P. Creasey in a most unlikely wet habitat close to the Welsh Harp reservoir. Equally unlikely was the rare clover *Trifolium ornithopodioides* found on her own lawn at Hampstead by Mrs M. L. Usherwood, but in this case a good explanation is available, in the form of sandy soil brought from the Suffolk coast in an attempt to improve the drainage of the lawn. Near Chiswick House Mr and Mrs T. D. Walker found *Polygonum mite* last seen in this locality by R. A. Boniface in 1966. Mr Boniface himself, in what sadly turned out to be the last year of his life, sent me a specimen from Hampton of the variety of greater periwinkle *Vinca major* with narrow corolla lobes.

In that part of v.c. 21 which is not in Greater London, having instead been tacked on to Surrey, R. B. Hastings found a single plant of golden dock *Rumex maritimus* among scattered marsh dock *R. palustris* in the drained south basin of Staines Reservoir. There are no previous records of *R. maritimus* from this district, where *R. palustris* is relatively common.

V.C. 24, Bucks

In a field near Wraysbury Station at the edge of our area, shown to Mr Hastings by C. D. R. Heard, small numbers of the two fluellens *Kickxia elatine* and *K. spuria* and of dwarf spurge *Euphorbia exigua* were found, the first record of these species since the 1930s, from that part of v.c. 24 within 20 miles of St Paul's Cathedral. According to modern boundaries this locality is in Berkshire!

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Obituaries

GEOFFREY EDWARD MANSER, 1917 – 1986

Geoffrey Manser was born at Beckenham, Kent, on the 9 April 1917. He died of cancer on the 28 February 1986. With his passing we have lost one of the Society's former leading ornithologists.

As a boy Geoffrey attended Beckenham Grammar School where he gained his School Certificate. He then worked briefly for an oil company before being called up at the beginning of the Second World War. He served in the 34th Training Regiment, Royal Artillery where he rose to the rank of Sergeant-Instructor. In June 1944 he was dispatched with a gun-crew four days after D Day, only to be wounded in Holland in the leg, arms and back. He was returned home and down-graded in fitness, but later rejoined his regiment until being demobilized in 1946.

Geoffrey took a temporary job as a wages clerk, but soon became one of two hundred students at a newly opened teachers' training college at Folkestone where he took a special one-year course to meet the shortage of teachers. Thus Geoffrey's teaching career began. His first post was at Anerley which was convenient as he and his family were living at Beckenham. In 1954 he moved to Hythe to fill a post at Willesborough near Ashford, and later at Sandgate near Folkestone. His final appointment, in April 1958, was to the headship of St Andrew's, Chinnor, a Church School of 250 pupils aged from 5-15. Two years later St Andrew's became a primary school and with Chinnor being rated the fastest-growing village in England the school expanded to 850 pupils, making it one of the largest primary schools in the country. Geoffrey started an autistic unit at St Andrew's. He was one of the first heads actively to encourage disabled children to come to the school. He retired from St Andrew's in 1977.

He was the complete village man and one of Chinnor's best-known residents: he was a churchwarden, Badge Secretary to the Scouts, Vice-President of Chinnor Silver Band, a founder-member of the Playing-Fields Committee and a helper at Age Concern in nearby Thame, where he also started a club for the visually handicapped. He helped at fetes, concerts and parties and many remember his wit and good humour when compère of concerts in the village hall, his beautiful flower arrangements in church and school, the Chinnor Nature Trail, the water-colours he painted, and especially his garden where there was something blooming all the year round.

Geoffrey joined the L.N.H.S. in 1934 and immediately started contributing to the annual bird report which at that time was incorporated in *The London Naturalist*. His observations in London ceased during the war, but started again in 1946 and continued until his move to Hythe in 1954. He had always been a keen ringer and joined the ringing group of the Ornithology Section in 1938, continuing to ring for the Society until 1958. Geoffrey was involved from the beginning with the foundation of Dungeness Bird Observatory when he and John Parrinder made the first reconnaissance about 1950. The Observatory became operational in 1952, and what better place to be professionally employed than in southeast Kent! He devoted much of his time to the D.B.O. and with Bert Axell and the writer made trials with the newly introduced mist-nets. Up till then Geoffrey's trapping had been done largely with Potter traps and 'a bit of salt on their tails'.

When Geoffrey took up his appointment at Chinnor he no longer continued to be involved in L.N.H.S. activities although he remained a member. His local interest was largely with little ringed plovers which nested at nearby cement-pits. In recent years he visited Lindisfarne regularly.

To his wife Ruth and children Helen and John we extend our sincere condolences.

K. H. Hyatt

RONALD ARCHIE BONIFACE, 1913-1985

Ron Boniface died on Christmas Eve 1985. He was born in Eastbourne and as a young man was a member of the Eastbourne Natural History Society. He botanised both locally and further afield in Sussex, travelling by bicycle.

During the Second World War his parents moved to Chiswick where he later joined them. In 1947 he became a member of the London Natural History Society and for the next ten years or so was a regular contributor to the Society's recorders for vascular plants and bryophytes. His paper entitled 'Hepatics of the London Area' was published in *The London Naturalist* for 1949. Throughout his years of membership he attended many of the Society's botanical field meetings. He was a very retiring man. Members will probably remember him best as walking quietly along writing the plants down in his notebook. His sharp eyes missed nothing.

Of the local floras and plant atlases published in the south-east since the war Ron was a contributor to those of Hertfordshire, London, Middlesex, Surrey and Sussex. He was a very careful and competent field botanist who would never give up. When others had decided the plant was no longer in the locality Ron would go on looking and quite often he refound it. Perhaps his most exciting rediscovery was that of *Cicuta virosa* in Sussex, first recorded *ca*. 1845.

Ron had an extensive knowledge of the flora of the environs of London and his death leaves a sad gap in our ranks. He leaves a daughter and a stepson and stepdaughter to whom we extend our sympathy.

JOYCE SMITH

ROBERT SPENCE WATSON POLLARD, 1907 – 1984

Robert Pollard was a senior partner with the solicitors Pollard Thomas & Co. He died in May 1984. Yorkshire born, he joined the L.N.H.S. in 1960 and immediately offered us his legal skills. A quiet, charming, always courteous man, he worked tirelessly on the generally unappreciated jobs – redrafting the Society's Rules, preparing agreements, helping to set-up covenant schemes, and similar tasks.

He served on various committees of the Council for Nature and the Central Committee for Commons Registration. He organized the London Gardens Guild and specialized in sorting out the legal tangles which beset charities large and small.

The L.N.H.S. has lost a good friend. We probably still do not appreciate how much he did for us.

A. J. BARRETT

London Natural History Society Statement of Affairs at 30 June 1985

1984 £	1984 £		£	£
		General Fund (incorporating the Hindson and Castell Bequests)		
98,401		Balance at 1 November 1984		127,122
	15	*Add:* Investment deposit interest	1	
	7,763	Investment income received	5,890	
	3,440	Income Tax recovered	1,749	
	21,877	Profits on sales of investments	20,632	
	33,095		28,272	
	(2,035)	*Less:* Custodian's charges	(2,238)	
	31,060		26,034	
	1,105	*Add:* National Savings Bank interest	1,054	
	132	Legacy (Estate of the late H. W. Payton)	—	
	212	Specific Funds surplus to requirements	99	
	32,509		27,187	
	(3,788)	Surplus for period on ordinary operations	1,785	
28,721				28,972
127,122				156,094
99		**Library Cataloguing Fund** (Now transferred to General Fund)		
		Current Liabilities and Provisions		
	3,800	*London Naturalist* provision	—	
	2,900	*London Bird Report* provision	—	
	—	Provision for current liabilities	680	
	75	Contribution to proposed tern raft	75	
	2,035	Custodian's charges	2,238	
	277	Section expenditure	129	
9,087				3,122
£136,308				£159,216

1984 £		£	£
	Assets		
121,734	**Quoted investments** at cost		143,857
	Market Value (1984: 222,449)	£237,493	
	Funds at bank and on deposit		
	National Westminster Bank plc		
1,745	Current account	439	
1,302	Deposit account	2,852	
1,254	Investment cash	3,618	
10,207	National Savings Bank account	8,361	
			15,270
66	**Cash in Hand**		89
£136,308			£159,216

On behalf of the Council

C. W. PLANT } Council
J. H. SAND } Members

Report of the Auditors to the Members of the London Natural History Society

We have audited the financial statements, comprising the Statement of Affairs and receipts and payments account, in accordance with approved auditing standards.

In our opinion these statements give a true and fair view of the receipts and payments of the Society for the period ended 30 June 1985 and of its assets, current liabilities and fund balances at that date.

4 London Wall Buildings,
LONDON EC2M 5NT
15 October 1985

FRASER KEEN
Chartered Accountants

General Account for the eight months ended 30 June 1985

1984 £	Payments	£	£
1,094	Hire of halls, etc		1,127
932	Lecturers' fees and expenses, Sectional expenses, etc.		1,151
—	Equipment repairs and renewals		90
826	Library		414
414	*Bulletin* and *Newsletter* expenses		171
—	Publicity		268
805	*Programme* printing costs		492
549	Costs of services (Auditors' fees, insurances, etc.)		537
700	Honoraria and expense allowances		200
149	Miscellaneous postage and telephone		145
615	Miscellaneous stationery		36
—	Research grant		50
20	Contributions to other organisations		—
1,574	Mailing costs (*L.N.* **63**, *L.B.R.* **48** *Programmes, Bulletins* and *Newsletters*— including postage, envelopes, etc.)		1,257
	Provisions —		
3,800	*London Naturalist* **63**, Nov. '84		—
2,900	*London Bird Report* **48**, Oct. '84		—
—	Current liabilities: Library, stationery and mailing		680
	Note: No provision has been made in these accounts for cost of *L.N.* and *L.B.R.* due for publication late 1985		
(3,788)	Excess of receipts over payments (transferred to General Fund)		1,785
£10,590			£8,403

1984 £	1984 £	Receipts	£	£
	6,647	Subscriptions – current	6,759	
	158	in advance	—	
	106	entrance fees	87	
6,911				6,846
267		Donations		203
393		Tax recovered from deeds of covenant		460
282		Deposit Account interest		150
74		Sale of literature and surplus library stock		—
		London Naturalist **63**		
	3.500	Provision 1984	3,800	
	—	Sale of offprints	43	
	(3,466)	Printing and expenses	(4,359)	
34				(516)
		London Bird Report **48**		
	3,000	Provision 1984	2,900	
	(3,107)	Printing and expenses	(2,895)	
(107)				5
	719	Sales of journals	812	
	(56)	Expenses	(100)	
663				712
34		Subscriptions to *Bulletin*		28
		Flora of the London Area		
	11,400	Provision 1984	—	
	2,055	Sales	501	
	(11,516)	Cash expenses	(15)	
1,939				486
		Atlas of Breeding Birds of the London Area		
	22	Sales	11	
	78	Royalties	18	
100				29
£10,590				£8,403

The London Naturalist

Instructions to contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr K. H. Hyatt, Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary, or synopsis.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22**: 130-132 (1895)), except that a colon should always precede a page number. Capitalization in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:
In text:
Meadows (1970 : 80) or (Meadows 1970).
In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49:** 76-81.

MELLANBY, K. 1970. *Pesticides and Pollution*. Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39-45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4.0 mm and tetrad crosses 5.0 mm, with a line thickness of 0.8 mm; all monad symbols should be 1.6 mm with a line thickness 0.5mm. The caption should be written outside the frame of the map and will be set up by the printer. The Mapping Schemes Secretary can provide Recording Maps, advice and dies for printing distribution symbols.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Proofs will be set to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to 25 free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

The London Naturalist

No. 65 **1986**

Immigrant Lepidoptera in the London area .... *Frontispiece*

Officers for 1986 3

The Society's Recorders 4

Report of the Society for 1985 6

PLANT, COLIN W. — Migratory Lepidoptera in the London area 7

LAYTON, R. L. — Gravel workings – a landscape feature in Epping Forest 31

INGROUILLE, M. J. AND LAIRD, S. M. — A quantitative approach to oak variability in some north London woodlands 35

GRIFFITH, DIANA — The flora of Totteridge and its neighbourhood 47

WILLIAMS, L. R. — Hay meadow flora at Fryent Country Park 65

DOUGLAS, MICK AND BRUNT, ANGELA M. — Banstead Woods – an ecological survey 83

INGLE, R. W. — The Chinese mitten crab *Eriocheir sinensis* Milne Edwards – a contentious immigrant 101

SNOW, K. R. — Mites of the grey squirrel *Sciurus carolinensis* Gmelin in Epping Forest 106

PLANT, C. W. — A working list of the hoverflies (Diptera: Syrphidae) of the London area 109

GROVES, ERIC W. — Hemiptera-Heteroptera of the London area. Part XVI 119

ENGLISH, PATRICK — The bush-crickets of Thamesmead 179

Survey of Bookham Common: Forty-fourth year
Progress report for 1985 181

BURTON, R. M. — Botanical records for 1985 193

Obituaries:
  GEOFFREY EDWARD MANSER, 1917-1986 199
  RONALD ARCHIE BONIFACE, 1913-1985 200
  ROBERT SPENCE WATSON POLLARD, 1907-1985 200

Statement of affairs at 30 June 1985 201

Book reviews 30, 33, 34, 64, 82, 100, 105, 118, 178

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